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RACTICE OF SURGERY.

BY

W. FAIRLIE CLARKE,

M.A. AND M.B. (OXON.), F.R.C.S.
ASSISTANT-SURGEON TO CHARING CROSS HOSPITAL.

> "Chirurgia non quidam medicamenta atque victus rationem omittit, sed manu tamen plurimum præstat."
>
> Celsus, *Præfat. Lib. VII.*

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PREFACE.

In preparing this edition of my Manual of Surgery I have gone carefully through the text, revising it, incorporating with it the former supplement on Bandages and Splints, and endeavouring at the same time to bring the whole work up to the level of the present day. There are, however, two points in which it will be found to differ from the former edition, and which will, I trust, add to its value and usefulness. Numerous illustrations have been introduced; and a Formulary of Receipts and Prescriptions has been added, to which frequent reference is made throughout the volume.

The general arrangement and classification of disease which have been adopted will be seen at a glance by reference to the Table of Contents.

Those branches of Surgery which have undergone such rapid development of late years as to have become almost separate sciences—such, for example, as the Surgery of the Eye and of the Ear—I have considered only so far as a knowledge of them is essential to every practitioner. Each of these branches has called forth a special literature of its own, and to this I must refer those who desire fuller information upon these subjects.

Ever since I was a student it has been my habit to make drawings of any cases of more than usual interest which came before me, and many of the illustrations which will be found in the following pages have been copied from sketches in my own portfolio. Some of the others have been taken from preparations in the Museum of Charing Cross Hospital, which were most kindly placed at my service by the Medical Committee.

I am well aware how difficult it is to give anything like an adequate view of the present advanced state of our knowledge in the compass of a small volume like this. I hope, however, that nothing which is of real importance has been omitted, and that, as far as it goes, it will be found a safe and trustworthy guide to the practice of Surgery.

W. F. C.

12, Mansfield Street,
Cavendish Square, W.

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PART I.

SURGICAL DISEASES.

LOCAL HYPERÆMIA OR CONGESTION

means the accumulation of blood which takes place in a part when the vessels are overcharged and dilated. Such accumulation may be either active or arterial, passive or venous.

Active congestion (Determination) is a vital process and depends upon an excess of blood in the arteries,—this excess being brought about sometimes by external irritation, sometimes by increased functional activity of the organ or part. The arteries are distended, and the bright red blood flows through them with great rapidity. Active congestion is not always a morbid state. The afflux of blood to the breast during pregnancy is a true example of determination. When, however, it occurs unnaturally, or interferes with healthy nutrition or secretion, it becomes a disease. It may be either acute or chronic. When acute, it may relieve itself by hæmorrhage; when chronic, it may lead to serous effusions, or to change in the nutrition or secretion of the part.

The *treatment* is that of inflammation in its milder degrees, and will be described hereafter.

Passive congestion is generally brought about by mechanical causes. Most frequently it depends upon venous obstruction; but it may also arise from general debility, or from a want of tone in the vessels of the part, as well as from other causes. When the circulation is only retarded the blood flows slowly through the distended vessels; when, however, it is altogether arrested complete stagnation takes place. If the obstruction be removed the circulation will soon recover itself, and the part return to its normal state. But if the cause of the disorder remain in operation, one of two things will speedily occur—either the vessels will give way, and allow the blood to escape—*hæmorrhage;* or the watery constituents of the blood will make their way through the walls of the vessels, giving rise to *serous effusion.*

When a part is passively congested it is somewhat increased in size, becomes of a dusky red colour and pits on pressure. The patient complains of a feeling of fulness and weight, with a difficulty in movement, accompanied by more or less pain of a dull aching character.

Treatment.—The great object is to remove the cause, be it a ligature, tumour, fæcal accumulation or anything else. This may sometimes be done by merely studying the position of the patient, and facilitating the return of blood to the heart. The next point is to relieve the distended vessels. This we effect by counter-irritation, scarifications, cupping, or leeching. Thirdly, we should aim at giving strength and tone to the vessels themselves by bandaging, friction, cold-bathing, and the use of stimulating or astringent lotions.

INFLAMMATION

lies at the root of many surgical diseases. It is, therefore, important that we should consider it at some length.

When we speak of inflammation, we mean a state which depends essentially upon an alteration in the circulation of the part, and which reveals itself by outward marks. These local changes are accompanied by certain constitutional symptoms, which, taken together, are expressed by the term *feverishness* or *pyrexia.*

The outward marks to which we allude are redness, swelling, heat, and pain. "Notæ inflammationis," says Celsus, "sunt quatuor, rubor et tumor cum calore et dolore." To these must be added impairment or loss of function. But it must be borne in mind that not unfrequently one or more of these symptoms is entirely absent or greatly modified, according to the seat of the disorder or the constitution of the patient.

To understand the nature of inflammation we must look below the surface, and study the changes which occur (1) in the circulation through the affected vessels, and (2) in the adjacent tissues.

If the web of a frog's foot is placed under the microscope and irritated, it is seen that the capillaries become dilated; and the blood stream, which was at first accelerated, is soon retarded. The red corpuscles crowd together in masses, while the white (leucocytes), which appear to be increased in number, adhere to the walls, or roll slowly along. Presently the circulation becomes altogether arrested, and stagnation takes place at various points. When the current of the circulation becomes very slow, the minute arteries are nearly blocked up with red corpuscles and the veins with leucocytes. Gradually these latter adhere to the sides of the vessels, and by their own amœboid activity pass through them into the surrounding tissues. The red corpuscles also escape, though less freely. At the same time there is transudation of the *liquor sanguinis* which furnishes the serous effusion. The migrated corpuscles not only increase by division and rapid multiplication, but they also excite the tissues into which they have escaped to increased cell-proliferation. There is greater nutritive activity, and thus is formed the cell-growth which plays such an important part in inflammation. This new cell-growth is unstable, and easily breaks down, and forms pus. The more intense the inflammation, the more rapid will be the cell-proliferation, and the lower the organization of the cell elements.

During inflammatory conditions of the system the blood, as a whole, appears to be thinner and poorer than in its normal state. The red corpuscles are diminished in number, and have a remarkable tendency to cohere by their flat surfaces, both in the body and after the blood has been withdrawn from it. The white corpuscles are relatively increased, while at the same time the fibrine may be doubled or trebled in quantity.

When inflammatory blood is drawn from the body, it coagulates more slowly than healthy blood; and, as it does so, the red corpuscles sink to the bottom, leaving the white corpuscles and the fibrine at the top. The pale yellow layer thus formed is called the " buffy coat," or the blood is said to be " buffed." When the top presents a depression in the centre and elevated edges, it is said to be "cupped" as well as "buffed." These appearances, however, are not peculiar to the inflammatory state. They are met with in the blood of plethoric persons and puerperal women, as well as under various other conditions.

The local changes that we have described are accompanied by certain constitutional symptoms, known as symptomatic, surgical, or irritative fever—feverishness or pyrexia. There is shivering or a "cold and hot fit." The pulse is quickened; the temperature is raised; the skin becomes dry, the mouth parched, the tongue coated, the bowels constipated; the urine is scanty and throws down a copious and high-coloured sediment, and the appetite fails; while at the same time the patient complains of aching pains in various parts of the body, and of a feeling of general weakness and languor.

The severity of these symptoms will depend much upon the degree and extent of the inflammation, as well as upon the nature of the part affected. They vary too according to the constitution of the patient. If he is robust and plethoric, the inflammatory fever will have a sthenic character, with a flushed face, a bounding pulse, and a white furred tongue. If, on the other hand, he is feeble or debilitated, the pyrexia will be of the asthenic kind, with a weak pulse, a brown tongue, and a tendency to low muttering delirium.

For the varieties of Surgical Fever, see p. 79.

Spread of inflammation.—Inflammation may spread in several ways:—(1) by continuity, along the same tissue; (2) by contiguity, from one tissue to an adjacent one; (3) by metastasis, the disease suddenly leaving one part and appearing in another; or (4) morbid material, capable of exciting inflammation, may be carried by the blood from one point to another, as in pyæmia.

Termination of inflammation.—There are two ways in which inflammation may terminate:—(1) by the death of the patient, from the severity of the attack, from the exhaustion produced by its long continuance, or from the vital importance of the part affected; (2) by resolution. The circulation may recover itself; healthy nutrition may be restored; any effusion that has occurred may be absorbed; secretion may be re-established, and the part may return in every respect to its normal state.

These are the only ways in which inflammation can properly be said to *terminate.* There are, however, certain secondary processes:—Effusion, adhesion, suppuration, ulceration, and mortification—which are often spoken of as terminations, but which are more correctly called the *events* of inflammation. To each of these conditions we shall allude presently.

Local effects of inflammation.—These are of the most opposite kind—*induration* and *softening, enlargement* and *atrophy;* but they may all be regarded as the result of imperfect resolution.

Induration occurs after long-standing inflammation with effusion, as the result of interstitial deposit of plastic material. Softening follows the more acute forms of inflammation as the result of impaired nutrition. Again, inflammation sometimes leads to an increase of bulk from enlargement of the vessels, effusion and cell-growth. Sometimes, on the contrary, its effect is to produce a decrease of size, by interstitial absorption.

Varieties of inflammation.—Inflammations are classified according to their *duration,* or their *character.*

Thus we speak of them as acute, subacute or chronic, according to the time that they last. The acute run a short course; the subacute a somewhat longer; while the chronic have a tendency to become indefinite in their duration. Or, if we look to the character of the inflammation, we speak of it as healthy or unhealthy, circumscribed or diffuse, strumous, syphilitic, &c.

The causes of inflammation are (1) predisposing, (2) exciting; and in each case they may act locally, or through the medium of the constitution.

Local predisposing causes are such as these:—The habitual over-use of a part—for example, of a joint; a chronic state of congestion; a previous attack of inflammation.

The constitutional predisposing causes are those which impair the purity of the blood, whether it be by excessive stimulation, or by a want of proper nourishment. Thus it is well known that indulgence at table predisposes to gouty inflammations; while, on the other hand, the poor and persons of a strumous habit, whose vital powers are enfeebled, are especially liable to other forms of inflammatory disease.

The local exciting causes are obvious. We need only mention injuries, contusions, wounds, scalds, &c.

The constitutional exciting causes are those states of the blood wherein it would appear that a morbid material accumulates, until it manifests itself in a local inflammation—as, for example, carbuncle, gout, acute rheumatism, &c.

Treatment of inflammation.—In considering this subject we must fall back upon the classification which we have already given, and speak first of the treatment of acute inflammation. When such a disease occurs in young and robust persons it calls for prompt and energetic measures. Sthenic inflammation is much under control, and we are often able to exercise more influence over it than we can over the other varieties.

The first thing is to remove the cause, if it be possible to do so. Thus, if a joint is inflamed from excessive use, it must be kept at rest; if an eye is inflamed from the presence of particles of sand, they must be taken away.

The next point is to diminish the flow of blood to the part, and this may be done either through the medium of the constitution, or by local means. The sum of such measures forms what is called the *antiphlogistic* treatment.

Constitutional treatment of acute inflammation of the sthenic type.—In the first place, everything which can irritate the patient, whether in body or mind, should be removed. He should be kept at rest in a well-regulated temperature, and placed upon a low diet. We must then consider what can be done for him by medical treatment, properly so called.

The most powerful weapon that we possess for subduing acute inflammation is *blood-letting*. But it is a weapon which must not be used without great caution, especially in the case of the young or the old, or in persons whose vital powers are enfeebled from ill-health, dissipation, or any other cause. It is so easy to *let blood*, and so difficult to restore it, that it is only when some organ of primary importance is in danger that we are justified in having recourse to this remedy.

Happily we have other means at our disposal, which are very effectual in reducing inflammation, and which are not open to the same objections as bleeding. These are *purgative*, *diaphoretic*, and *diuretic* medicines.

In almost all cases of inflammation it is right to give a free purge at the outset of treatment. The exceptions to this rule are certain cases of abdominal inflammation, when we desire to keep the bowels quiet rather than to excite them to action. Perhaps for an adult the best purge that can be given is a mercurial, followed by a saline or aloetic draught—*e.g.*, 5 grains of blue pill at night, followed next morning by ℥j of the mist. sennæ co., or of the decoct. aloes co., or a seidlitz powder. This has the effect of clearing the *primæ viæ*, promoting the secretions and relieving the circulation. It may be necessary to repeat this remedy from time to time as the case proceeds.

If we use diaphoretic or diuretic medicines their action must be kept up by doses given two, three, or four times a day. Antimonials often answer admirably by encouraging perspiration and tranquillizing the circulation. At the same time, the skin and the kidneys may be stimulated by salines, such as the acetate of ammonia, or the nitrate of potash. (F. 29, 45, 54.)

Mercury has a time honoured reputation for allaying inflammation, especially in serous and fibrous membranes. Of late years, however, its value in this respect has been called in question; but there can be little doubt that it is a useful remedy in acute inflammations of a sthenic type, particularly when combined with opium. Its action seems to be that of an alterative, promoting secretion and moderating the force of the heart. But besides this, it would appear to exert a special influence over the fibrine of the blood by diminishing its quantity. (F. 70.)

Opium is of great service in allaying pain, soothing the patient and procuring sleep. In the form of Dover's powder it is invaluable. Its use in combination with mercury has been already mentioned.

Local treatment of acute inflammation of the sthenic type:— *Local blood-letting* is a practice much in vogue at the present day, and may almost be said to have superseded venesection.

Undoubtedly it gives us many of the good effects of general bleeding, without the disadvantages which belong to that method of depletion.

It may be carried out in a variety of ways; by *incisions*, *scarifications*, *cupping*, or *leeches*.

Incisions are specially applicable to the skin when it is stretched in such a way that it is in danger of sloughing. A number of small cuts should be made with a lancet in parallel rows, extending only to the depth of the true skin.

Scarification is chiefly used when the inflammation attacks the mucous membranes—as, for example, the lining of the mouth or the gums.

Cupping is an efficient means of removing blood, and relieving the over-burdened circulation. It is, however, more suited to deep-seated than to superficial inflammation. The cupping-glasses should not be placed upon the inflamed spot; nor should the scarificator be used in parts which are left uncovered by the dress—as, for example, the neck—because the scars are apt to remain for life. The "artificial leech" is a modification of cupping, which is well adapted to some deep-seated and localized inflammations, for example, of the eye.

Leeches are extremely useful in allaying acute inflammation. They should be placed, not upon, but around, or in the neighbourhood of, the disease. They should be used in sufficient numbers to produce a marked effect. It is estimated that each leech abstracts fully half an ounce of blood. There are some situations in which they ought not to be employed; for example, on the scrotum, or eyelids, for fear there should be difficulty in preventing hæmorrhage or ecchymosis; nor near specific sores, lest the bites should become affected with the morbid poison.

Bleeding may be encouraged by warm poultices or fomentations. On the other hand, it may be arrested by pressure or styptics, such as the tincture of the perchloride of iron, powdered matico, or lunar caustic.

Warmth, particularly when conjoined with moisture, is a remedy of the utmost service in acute inflammation. It may be applied either in the form of a poultice or a fomentation, and both these methods may be rendered more efficient by medication. The poultice may be mixed with laudanum or tincture of henbane; or in making the fomentations a decoction of poppy heads or chamomile flowers may be used instead of plain water. Warmth and moisture are particularly applicable when the inflammation is at its height. They relieve tension, mitigate pain, and promote suppuration. But for the earlier stages, while suppuration may yet be averted, as well as for the later, cold will often be found a more useful remedy. In deciding whether to have recourse to warm or cold applications, it may sometimes be well to consult the patient's feelings, and to see which gives him the most relief. The general rule, however, is as we have stated—namely, that when the inflammation is at its height, warm and moist applications will be found the most efficient, while cold will be more useful in the earlier and later stages. When cold is employed in the early stage of an inflammation it is with the view of anticipating the morbid action, and preventing its further progress. Thus, a wound of a joint, threatening the most serious consequences, may sometimes be conducted to a successful result by the use of a splint, and the continuous application of cold. In the later stages of acute inflammation, cold is of great use in giving tone to the vessels, and preventing a congested state of the part, which is apt to remain after the more urgent symptoms have subsided. It may be applied by irrigating the part with cold water, or by covering it with evaporating lotion; or more effectually by an ice poultice (F. 83), a bladder, or by an india-rubber bag filled with pounded ice, or ice and salt, laid upon the part.

The treatment of acute inflammation of the asthenic type must not be in the slightest degree antiphlogistic. Depletion would do harm instead of good. Everything which is calculated to lower the patient should be carefully avoided. *Locally* we must confine ourselves to the milder and more soothing measures that have been mentioned, poultices, fomentations, &c.

It is the *general health* which is at fault, and to this we must address ourselves. We must examine the state of the pulse, tongue, skin, and secretions. If the pulse is rapid and weak, the tongue brown and covered with sordes, and the skin hot and dry, we must have recourse to a stimulating and supporting plan of treatment. A light but nourishing diet should be given, combined with wine or brandy. We must take care that the patient has a proper and sufficient diet on the one hand, and that he is not over-stimulated on the other. The medical treatment consists in clearing out the bowels by a gentle purgative, and then giving salines with carbonate of ammonia, ether, bark, and similar drugs. The action of the skin may be promoted by diaphoretics, while restlessness and irritability are allayed by opium.

Treatment of chronic inflammation.—Chronic inflammation—that is to say, an inflammation which tends to last an indefinite time—may depend either upon a continued source of irritation, or upon relaxation of the vessels following an acute attack. Our first business must be to ascertain the cause of the disease. If this should prove to be irritation, we must endeavour to remove or allay it. Should it be a relaxed and dilated state of the vessels of the part, we must try and restore their healthy tone.

The source of irritation is sometimes local; as, for example, a foreign body or a morbid growth. But much more frequently it has a constitutional origin, and depends upon a strumous habit, or a disordered digestion, or a faulty state of the secretions.

If the irritation is kept up by the presence of a foreign body, we must consider whether it would admit of removal; or, if not, how far its effects may be mitigated. If, however, the irritation arises from an impaired digestion, great benefit may be derived from a regulated diet, combined with moderate exercise in the open air, and the use of aperient, alterative, or tonic medicines. Small doses of grey powder or Plummer's pill may be given at short intervals, and continued for a length of time, but they must never be allowed to produce salivation. When used in this way mercury has a double value. It serves to subdue inflammation, and at the same time it promotes the absorption of the effused material. Iodide of potassium, in addition to its antisyphilitic properties, is very valuable as an alterative and absorbent.

If the patient is of a strumous habit, we must prescribe cod-liver oil, or the preparations of iron and quinine; taking care at the same time that the diet is light, nutritious, and given with regularity.

If the chronic inflammation depends upon a relaxed state of the vessels of the part, we must, in addition to constitutional remedies, resort to local measures. The distended vessels may be relieved from time to time by local bleeding, while we endeavour to impart strength and elasticity to their coats by stimulating or astringent applications, such as the sulphates of zinc or copper, or the nitrate of silver.

Friction is very useful in cases of this kind; particularly if some stimulating liniment is rubbed in at the same time, and the rubbing conducted in such a manner as to promote the venous circulation.

Counter-irritation, by means of blisters, setons, issues, the actual cautery, or rubefaciant embrocations, is one of the most efficient remedies that we possess for removing chronic inflammation.

Rest and equable pressure by means of a well-adjusted bandage are often of the first importance, and without them the other measures I have enumerated are frequently of little avail.

Cold sponging, or the use of a cold douche bath, is a very simple and at the same time a very efficacious remedy. This may often be employed in conjunction with some of the other means already mentioned.

EFFUSION.

Effusion—the escape of some of the constituents of the blood—is, as we have seen, an integral part of the inflammatory process. But effusion occurs also as the result of passive congestion; and both these conditions are of so much interest to the surgeon that we shall devote a brief section to their consideration.

The effusions which are met with in surgical practice sometimes consist of blood, sometimes of *liquor sanguinis*, sometimes of serum.

When blood is effused it is by the rupture of some of the minute vessels. The effusion of *liquor sanguinis* is properly speaking a transudation. The watery portion of the blood, holding the fibrine in solution, escapes, while the corpuscles are left behind. The fluid drawn by a blister is *liquor sanguinis*. But the most common effusion is the serous. The fluid that is poured out usually contains a small quantity of fibrine together with a large amount of albumen. When such effusion occurs in the serous cavities, it gives rise to *dropsies*; when it takes place in the cellular tissue, it occasions *œdema*. When the serum has been absorbed, and the fibrine deposited in the tissues, the condition known as *solid œdema* is produced.

ADHESIVE INFLAMMATION.

Inflammation is said to be adhesive when it leads to the effusion of fibrine, lymph, or plastic material. The study of this variety of inflammation is of great importance, because it is the medium by which the natural reparative processes are carried out in a large majority of cases. Effused lymph is met with in two states. Sometimes it is *healthy, plastic, fibrinous;* at other times it is *unhealthy, aplastic, corpuscular*. These are the terms in general use to distinguish the two kinds of lymph. The former is the "coagulable lymph," properly so called. It contains a large proportion of fibrine, and tends to become organized. The latter is composed chiefly of corpuscles, suspended in a thin serous fluid, and it tends to degenerate. Such degeneration often takes the form of an unhealthy suppuration. For the sake of clearness, the two kinds of lymph may be contrasted with one another in this way. But in practice they are found blended and intermingled in an endless variety of proportions. It is hardly too much to say that no two specimens are exactly alike.

When lymph has been effused, it may undergo *absorption, development*, or *degeneration*.

When lymph is absorbed it probably first breaks down, and is carried away as débris. The part is then restored to its natural state.

Coagulable lymph is capable of being organized into a variety of forms; for it is, as we have said, the medium through which nature effects all her reparative processes. It passes through the form either of "nucleated blastema," or of a mass of nucleated cells, and becomes fibrous or fibro-cellular. It is then more fully developed, and gradually approaches the characters of the tissue which has to be repaired. It is only the simpler tissues which are perfectly reproduced; while the place of the more complex ones is supplied by an imperfect substitute.

The way in which lymph becomes organized is an interesting question. It is now held by most observers that offsets from existing vessels enter it at its margins, and, by forming a series of loops or arches, ultimately pervade the whole mass.

The degeneration to which lymph is liable is of two kinds. It may wither into a dry and horny substance, or it may become granular and fatty.

SUPPURATION.

Suppurative inflammation is that variety which leads to the formation of pus.

Healthy or laudable pus is a thick, opaque fluid, of a yellowish-white colour, a faint odour, and generally of an alkaline reaction. Under the microscope it is found to consist of a thin fluid, the *liquor puris*, and corpuscles. The greater the number of corpuscles, the better is the quality of the pus. Sometimes it is mixed with blood, and then it is said to be *sanious;* sometimes it is watery and acrid, when it is termed *ichorous;* sometimes it is *curdy*, and contains flakes of coagulated lymph. These are some of the chief varieties of pus that occur in practice; but, whatever its particular characters, it is never met with except as the result of inflammation. The corpuscles may be regarded as exudation-cells, and the *liquor puris* as serum, modified by the progress of the inflammatory action.

In most cases pus may be easily recognised by its appearance, or by its becoming viscid and ropy on the addition of *liquor potassæ*. If, however, any difficulty should arise, the microscope will generally enable us to distinguish it from tubercle, cancer, softened fibrine, turbid serum, or other substances with which it might be confounded.

Pus may either be formed on a free surface, as, for example, on a mucous membrane; or deeply among the tissues. In the latter case it constitutes an *abscess*.

Suppuration, whether superficial or deep, may be either *acute* or *chronic;* it may run its course in a few day, or it may last for months or even for years.

Again, it may be either *circumscribed* or *diffused*. When suppuration takes place in a healthy individual, the lymph, which is poured out in the early stage of the inflammation, serves as a boundary wall and limits the spread of the suppuration. But when the patient's constitution is broken, no such barrier is formed, and the suppurative inflammation becomes diffuse.

When pus is about to be formed on a free surface, we observe the ordinary signs of acute inflammation.

When an *acute abscess* is about to form there are some additional points which may be noticed. The pain has a throbbing character. The skin becomes tense, shining, and sometimes œdematous. In the course of a short time, *fluctuation* may be detected—that is to say, when a finger is placed on each side of the swelling, and pressure is made from one point to the other, a peculiar sensation is communicated, which indicates the presence of fluid.

Suppuration, like other events of inflammation, is commonly attended by certain constitutional symptoms. There is feverishness, with loss of appetite, and, when matter has begun to form, there are " chills and heats," or perhaps distinct *rigors*.

When the discharge of pus is profuse and long-continued, it is apt to give rise to *hectic*. (*See* HECTIC.)

In the case of a *chronic abscess* the signs are somewhat obscure; neither the local nor the constitutional symptoms are well-marked. An indolent, circumscribed swelling appears, which is indistinctly fluctuating, and free from pain or tenderness. If it happens to be enclosed in a tough cyst, the difficulty of diagnosis will be increased. When it approaches the surface it becomes painful, involves the skin, ulcerates, and discharges itself.

Sometimes the inflammation which precedes suppuration is so slight, or so slow in its progress, that it excites no uneasiness, until a swelling is detected containing pus. Such, at least, would seem to be the pathology of *cold abscesses*.

What circumstances conduce to suppuration? How comes it that in one case inflammation gives rise to adhesion, while in another it leads to the formation of pus? This seems to depend upon the quality of the effused material. In proportion as it is healthy or fibrinous, adhesion is likely to take place; while on the other hand, in proportion as it is unhealthy or corpuscular, it is prone to suppurate. In truth, there is but a step between the exudation-cell and the pus-globule.

The quality of the effusion depends in a great degree on the state of the patient's health; when this is good, the character of the effusion will be good also, and *vice versâ.*

Again, the seat of the disease influences the nature of the effusion: mucous membranes very readily suppurate; serous membranes but seldom.

Again, the access of air seems to promote suppuration. Hence the advantage of a subcutaneous incision to which little or no air is admitted.

The *treatment of suppuration* is partly *local* and partly *constitutional.*

Locally, we must try to take away the cause, if it be a foreign body, a piece of dead bone, or anything else that is capable of removal. Such things are often the causes of chronic abscess. Then we must endeavour to reduce the inflammation, by studying the position of the part, and by using cold lotions, water-dressing, fomentations, or poultices, as the case may require. Lastly, we must give a favourable exit to the pus, and do what we can by antiseptic, stimulating or astringent applications, to bring about a more healthy action, and to limit the amount of discharge.

An acute abscess should be covered with a poultice made of bread, bran, chamomile flowers or linseed-meal. As soon as fluctuation is detected, a sufficient incision should be made to let out the pus, and the poultice continued.

A chronic abscess will often require to be laid freely open, stuffed with lint, and allowed to heal from the bottom.

In the case of a large chronic abscess, connected with disease of the spine, for example, it is best to make a small *valvular incision,* that is to say, to pass the knife obliquely under the skin for a short distance before it reaches the cavity; or the air-tight syringe, known as the "aspirator," may be used. By these means the entrance of air is prevented, while the matter is drawn off, a little at a time, on repeated occasions, so as to allow the walls of the abscess to contract gradually.

The older surgeons used to regard suppuration with more favour than we do at the present time. With certain exceptions it is scarcely too much to say that the modern surgeon wishes to prevent altogether the formation of pus, and that the aim of surgery in this respect is to counteract the irritating influence of putrefaction, so as to reduce all wounds, as it were, to the condition of subcutaneous injuries. Many attempts have been made to effect this object, and various methods of practice have been suggested; but the most successful is undoubtedly that which has been introduced by Professor Lister of Edinburgh. I have had the advantage of witnessing the antiseptic system as it is carried out in his wards, and I cannot doubt its value. I shall, therefore, briefly describe it.

Mr. Lister has found no substance so convenient for antiseptic dressings as carbolic acid. He employs a watery solution (1 to 100), an oily solution (1 to 10 of olive oil), a gauze impregnated with carbolic acid in paraffin, and a protective plaster of silk coated with copal varnish, containing no carbolic acid, but intended to protect raw surfaces from the immediate contact of what would act as an irritant. With the watery solution milder cases are dressed, and an antiseptic atmosphere is kept up around a wound by means of Richardson's spray apparatus during the time that it is being examined. With the oil the hands of the surgeon and his instruments are smeared; and sometimes the ligatures and the dressings are saturated with it. The antiseptic gauze, which retains and gives off the carbolic acid for a long time, is placed over the wound to create an antiseptic atmosphere.

Let us now suppose that a lumbar abscess is to be opened upon Lister's principle. The skin around the point of puncture and the knife are smeared with carbolic oil, and a large piece of lint saturated with the same is held over it. The abscess is freely opened, the veil of lint is dropped over the incision, and the contents of the cavity are gently pressed out, the discharge oozing from underneath the carbolized veil. Or the whole operation may be performed in an antiseptic atmosphere created by a cloud of spray from Richardson's apparatus. Over the incision are then placed a few folds of antiseptic gauze, secured by a bandage. The same precautions must be observed every time the wound is dressed. Putrefaction is thus prevented, and the evils that it carries with it are avoided. When the wound is granulating freely, the protective is used to moderate the direct action of the carbolic acid, that the atmosphere of the wound may be thoroughly antiseptic, while the granulations are not unduly irritated. The freedom from all offensive smells, and the fact that the protective (which contains a small quantity of litharge), keeps its normal colour, and is not blackened by the escape of sulphuretted hydrogen, give proof of the absence of putrefaction. Practically this last is a very delicate and useful test, for as soon as decomposition commences in the albuminous discharges a black sulphuret of lead is formed on the protective. Even when, in spite of all our efforts, suppuration takes place in a wound, the antiseptic treatment should not be abandoned, for there is a wide difference to the patient whether the pus which is lying in contact with a raw surface is or is not in a state of putrefaction.

The "germ theory," upon which Lister's method rests, must still, I think, be considered *sub judice*. That the irritation which the air undoubtedly causes in a wound is due to the organic particles which it contains, and not to its chemical or physical qualities, seems to me a proposition which is "not proven." Still there can be no question of the value of carbolic acid, whatever may be its *modus operandi*, and of the credit which is due to Lister for having introduced it into practice.

When it is used as a simple lotion (F. 9) or when dressings are kept constantly moist with it by droppings from a syphon bottle, its beneficial effect is beyond a doubt; but it should be borne in mind that this is not Lister's method, and that cases thus treated should not be classed with those in which all the details recommended by the distinguished Edinburgh Professor have been thoroughly carried out.

Carbolic acid is not the only substance which has been used to check suppuration. Mr. Campbell De Morgan has introduced a strong solution of chloride of zinc (40 grs. to the ℥j) to sponge out wounds immediately after operation; and a weaker solution (F. 24) may be used in subsequent dressings. Sulphurous acid lotion (F. 11) may be employed with great benefit for the same purpose.

The *constitutional treatment* of suppuration consists in supporting and improving the patient's health. This may best be done by placing him in the most favourable hygienic conditions, ordering a light and nutritious diet, and such medicines as the mineral acids, steel, cod-liver oil, and quinine.

ULCERATION.

Ulceration is commonly described as the "molecular death" of a part; and this destructive action may either occur where the surface is already broken, or it may itself give rise to a solution of continuity. The essential nature of ulceration is involved in some obscurity. We may, however, divide the process into two stages—(1) That in which the tissues are broken down and disintegrated; (2) That in which the débris is removed or discharged.

The first stage, that of disintegration, seems to arise either from simple arrest, or from an impairment of nutrition.

When the supply of blood to a part is cut off, ulceration is apt to follow, from simple arrest of nutrition. There are certain situations, the *alæ nasi*, for example, where the circulation is naturally feeble, which are specially prone to this form of disease.

But an impaired or faulty nutrition is a far more common cause of ulceration. These unfavourable changes in the nutrition of the part are generally brought about by inflammation. Sometimes they follow directly upon an acute attack; sometimes they result from the alterations of texture—the hardening or the softening—which are left behind after the acute symptoms have subsided. In these two ways inflammation is a frequent source of ulceration, though, as we have said, ulceration may occur without inflammation.

Whatever lowers the vital power, either of the part or of the constitution generally, *predisposes* to ulceration—for example, advancing age, broken health, loss of nerve force, chronic congestion, a strumous or syphilitic taint, and many other conditions.

The most common *exciting causes* of ulceration are acute inflammation, mechanical injuries, chemical irritants, and continuous pressure.

The second stage of ulceration is that in which the débris is removed. Such removal may take place either outwardly or inwardly. The disintegrated tissue is in the great majority of cases thrown off from the ulcerating surface in a purulent discharge, but it may also be absorbed by the lymphatics and veins. This "ulcerative absorption" is, however, comparatively rare. The purulent discharge is sometimes gritty from the presence of minute particles of solid matter. This is specially the case when bone is involved.

Treatment.—The local treatment consists in studying the position of the part, allaying inflammation by the means that have been already mentioned, and endeavouring to mitigate the ulceration or to improve its character. This may be done by the use of sedative, anodyne, astringent or stimulating applications. In some cases the ulcerating surface may be destroyed by a strong caustic. This mode of treatment is particularly applicable to specific and unhealthy sores.

The *constitutional* treatment is of the utmost importance. The patient should be placed in a pure and fresh air. His diet and manner of life should be regulated; while at the same time his general health may be improved by tonic, anti-syphlitic, or anti-scorbutic medicines.

MORTIFICATION.

Mortification signifies the death of a part. The process of dying is by some called *gangrene,* and the state of complete death *sphacelus.* By others these terms are used as synonymous. When a limited portion of tissue dies it is said to slough; but the changes which take place in sloughing and mortification are much the same, the only difference is in extent. Indeed, ulceration, sloughing, and mortification may be taken to be ascending degrees of the same morbid process.

Gangrene is divided into *moist* and *dry.* The former generally depends upon venous obstruction, and is usually accompanied by inflammation. The latter may exist without inflammation. Its most frequent cause is a deficient supply of blood; and this deficiency may arise either from disease or from injury, *e.g.*, from senile changes or from crushing violence. This leads us to another distinction, which it is very important to bear in mind—namely, that a part may perish either from *constitutional* or from *local* causes.

When a part is about to die it becomes of a dusky red or purple colour, and frequently presents a mottled appearance. It becomes doughy, and easily breaks down under pressure. The temperature falls, and there is loss of sensibility. There is dull, heavy pain, occasionally rising into acute paroxysms. The cuticle is raised into bullæ, and an evolution of gas takes place. These symptoms are more marked in moist gangrene, attended by a high degree of inflammation, than in the dry variety. In the latter the part simply withers—becomes *mummified.*

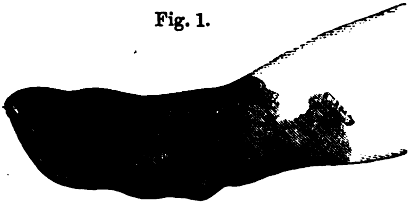
These local symptoms are always accompanied by great exhaustion, and by a tendency to the typhoid forms of inflammatory fever.

The principal causes of gangrene are: (1) external injuries, (2) an arrest in, or a deficiency of, the blood-supply, (3) obstruction to the venous circulation, (4) specific poisons, as in the cases of cancrum oris, malignant pustule, or sloughing phagedæna.

Under the first head fall accidents attended by severe contusion and laceration.

Under the second, ligatures of the main arteries, embolisms, and cases of deficient blood-supply from weakness of the heart, exhaustion, or narrowing of the arterial channels. Fig. 1 represents a case of gangrene in an infant eleven months old who was under my care. The little patient was recovering from an attack of measles when the left foot became black, hard, and dry; and on the thirty-second day dropped off at the ankle-joint, leaving the ends of the tibia and fibula protruding. A proper stump was then formed, and the child made an excellent recovery. (Path. Soc. Trans. vol. xx.)

Fig. 1.



Gangrene of the foot in an infant.

But how is the spread of this destructive process limited? If the gangrene depends upon a simple arrest of the circulation—*e.g.*, on plugging or deligation of the main artery—then the seat of such obstruction will determine the point where the disease ceases. A red line of healthy inflammation—the *line of demarcation*—will indicate the separation between the living and the dying tissues.

If, however, the gangrene arises from inflammation, it may continue to spread until it reaches a point where the vitality of the tissues resists its action. They are in a more healthy state, and the inflammation which they exhibit is of a more healthy kind also. Instead of being killed by the intensity of the inflammation, they are able to throw out lymph, which forms a barrier to its further progress. The gangrenous inflammation is then changed into the adhesive.

The same happy result occurs when the inflammatory action subsides to a degree which is compatible with the effusion of lymph.

When a line of demarcation has been formed, a process of ulceration immediately begins, by which the mortified part is separated and thrown off.

Treatment.—In the early stage of a traumatic gangrene in a robust adult, attended by much inflammation, we may have recourse to the local abstraction of blood. Nature herself indicates this, for we sometimes see great benefit follow spontaneous hæmorrhage. By taking blood from the part tension may be relieved, the circulation freed, and the spread of the gangrene arrested.

Incisions—either a number of small, or a few larger ones—may often be made in the affected part with advantage. They not only relieve the over-stretched tissues, but they may also give vent to the *materies morbi*, as, for example, in extravasation of urine.

At the same time the other local means for allaying inflammation, which have already been mentioned, should not be omitted.

The separation of sloughs should be promoted by poultices, and the unpleasant smell may be overcome by disinfectant lotions, or by charcoal or yeast mixed with the poultices.

The denser tissues, as tendons and bones, may be divided in order to hasten the process of separation: but it is best to leave the soft parts to themselves.

After the mortified portion has been removed the exposed surface should be treated as an ordinary sore with water-dressing, or with anodyne, antiseptic, or stimulating lotions, as the case may require.

In regulating the constitutional treatment we must bear in mind that mortification is often the result of debility, and that the gangrenous inflammation is always accompanied by fever of the asthenic and irritative type. Moreover, the separation of the dead tissues is an exhausting process, and one which makes great demands on the vital powers of the patient. Everything therefore which has a lowering tendency must be strictly avoided. The air of the sick man's room should be kept as fresh as possible, his diet should be light and nourishing, while his strength is upheld by tonic medicines and stimulants. Sedatives and narcotics will here be found of the greatest service, and should be given freely.

Senile gangrene is that variety which is met with in persons advanced in life, and which depends essentially upon degeneration of the coats of the vessels. A calcareous deposit takes place in the walls of the arteries, and this affects the circulation in two ways: (1) by diminishing the calibre of the vessels, and (2) by impairing the elasticity of their coats.

Senile gangrene generally attacks the feet. Beginning in the toes it spreads gradually to a greater or less extent over the foot and leg. The local inflammation is usually slight, and confined to the margins of the gangrenous part. The tissues at first become mottled, of a bluish or purplish colour, and the cuticle is detached and raised in blisters. Gradually the part becomes brown or black, and at the same time dry and withered. When a line of demarcation has been formed, the dead tissues are separated from the living by a process of ulceration, in the way that has been described.

Senile gangrene is always attended by great exhaustion, severe pain, and a tendency to low irritative fever. From these causes, combined with the age of the patients, it is a very fatal disease. Occasionally the mortified part is thrown off and recovery takes place, but such a fortunate result is quite exceptional.

The best *treatment* consists in enveloping the part in cotton-wool, so as to maintain as high and equable a temperature as possible. If need be, a disinfecting lotion may be applied. At the same time everything should be done to support the patient, to husband his strength, and to quiet his nervous system. Alcoholic stimulants should be given with caution, because it is hazardous to overstrain the diseased vessels.

Question of amputation.—A question often arises whether we should resort to amputation in gangrene, and, if so, at what period of the disease. Upon this point the special circumstances of each case must go far to form our opinion. The general rule, however, may be stated thus:—In gangrene resulting from a local cause—as an accident, ligature, or embolism—an amputation may be undertaken as soon as the discoloration of the tissues has indicated the extent of the affected part. But in the state of spontaneous gangrene it is well to wait for a decided line of demarcation, and then to content ourselves with dividing the hard tissues and shaping the stump, rather than to perform a complete amputation. If the gangrene, though beginning in a local cause, shows a tendency to spread indefinitely, it should be treated as a case of spontaneous mortification, and no operation should be undertaken until a well-marked line of demarcation has declared itself.

PROCESSES OF REPAIR.

We may here conveniently consider the *processes of repair.* They are—

(1) *Immediate union.*—This only occurs in slight and clean-cut wounds. When the oozing of blood has ceased, and the surfaces have been brought into accurate apposition, they become directly incorporated with one another. In such a case there is no inflammation and no appreciable uniting medium.

Even if a small part of the body, such as the point of a finger, is entirely cut off, the surgeon need not despair of union taking place. Though we have no Balsam of Fierabras—of which Don Quixote says he had the receipt in his head, and cannot promise that if a man were cut in two, stuck neatly together, and took two draughts of the Balsam he would immediately become whole and sound as an apple (ch. x.);—yet many cases are on record in which a small portion, after having been completely separated, has been replaced, and has united and grown as if it had only been partially, and not entirely, removed.

(2) *Union by adhesion*—"union by the first intention"—can only take place between surfaces which are in apposition, and in persons whose general health is pretty good. It is attended with some degree of inflammation, enough to produce a layer of plastic material between the opposed surfaces. By this means they are glued together. There is union by adhesion. Gradually the layer of lymph becomes organized and assimilated to the adjacent tissues.

(3) *Healing by scabbing* is a process of repair which takes place on free surfaces. Like the foregoing, it is attended with a very limited amount of inflammation. There is a slight effusion of lymph, which protects the raw surface from the external air, and allows healthy nutrition and repair to be carried on beneath it. We sometimes endeavour to bring about this mode of healing, and to imitate the action of nature by an artificial scab of lint saturated with Friar's balsam or collodion.

(4) *Granulation*—"union by the second intention." When the destructive processes, ulceration, suppuration, and gangrene, have terminated, nature immediately begins to repair the damage that has been done. The raw and exposed surface is covered with a layer of plastic material—coagulable lymph; beneath this, and in its substance, granulations spring up—small elevated papillæ, closely studded together, of a bright florid colour, and bathed in healthy pus. They are freely supplied with blood by loops and arches from the subjacent vessels, but their sensibility is generally low. These are the characters of healthy granulations. But they vary exceedingly. Sometimes they are irregular and exuberant; sometimes they are pale and flabby; at other times they have a dusky and congested appearance; or, again, they may secrete a thin and acrid discharge.

When two granulating surfaces, as the sides of a wound, are brought into apposition, adhesion may take place between them.

(5) When the granulations have risen to the level of the surrounding tissues *cicatrization* commences. The margins of the granulating surface cease to secrete pus, and become smooth and varnished over with a thin bluish-white layer, which is the first indication of the new skin. This process of healing spreads from the edges, or from any islands of skin that may have been left, or that may have been grafted by the surgeon. It never seems to begin in the centre of the raw surface. As it goes on, it draws the margins together by concentric contraction.

After the whole has been skinned over, other important changes are gradually developed. The cicatricial tissue, which was at first thin, blue, and shining, becomes thicker, of a natural colour, and covered by a layer of epithelium; in fact, it approaches, though it never attains, the characters of true skin. Again, after a cicatrix is fully formed it continues to contract. This contraction may go on for months or years, and give rise to some of the most dreadful disfigurements and inconveniences that are met with in surgical practice.

MALFORMATIONS.

The cases of congenital malformation may be divided into two classes:—

1. Those in which there is an *arrest* of development, as spina bifida, harelip, cleft palate, imperforate anus, &c.
2. Those in which there is an *excess* of development, as supernumerary fingers and toes, &c.

Of the *causes* of such malformations, our present knowledge enables us to offer no explanation.

Intra-uterine disease often gives rise to deformities. Thus, the fœtus may meet with a fracture or a dislocation, or it may be born with club-feet. One of its limbs may even be caught in a noose of the cord and be *spontaneously amputated.*

HYPERTROPHY

means an increase in the size of a part from over-development of its normal and healthy structure. It is sometimes congenital, but generally it is the result of increased use, and in many cases it is a provision of nature to meet the exigences of disease. As examples I may mention the congenital hypertrophy of the tongue that is sometimes seen in infants; the increase which takes place in the muscular coat of the bladder in long-standing cases of stricture; or the development which one kidney undergoes when the other is unable to perform its functions.

ATROPHY,

on the other hand, means the decrease which takes place in a part from wasting of the proper tissue, or from its deficient deposit. It depends upon a variety of causes, want of use, excessive use, impaired vitality, a diminution of the muscular or nervous supply, &c.

Atrophy is very often accompanied by *degeneration.* The proper tissue is not formed at all, or is formed in deficient quantity;

while its place is occupied by fibrous, earthy, or fatty material. Of these degenerations the most common is the fatty. Indeed, there is hardly a tissue in the body which is not liable to be affected by it.

TUMOURS.

By a tumour is meant a living mass, which is either different in character from the healthy tissues or else excessive in its growth. A cancer differs from every other tissue which is met with in the body, not so much in its histological elements, as in their arrangement. A fatty tumour is merely excessive in its growth; the material of which it is composed is identical with the ordinary adipose tissue.

Tumours have long been divided into two great classes—the *non-malignant* (innocent, benign), and the *malignant* or *cancerous*. To these it has been found necessary to add a third class, the *semi-malignant* or *recurrent*. This is not perhaps a very scientific classification, but it is one of great practical value.

The *non-malignant* or innocent tumours may be regarded as being from first to last local diseases. They may often be traced to purely local causes. When they are solid, their structure resembles some one of the normal tissues of the body—they are *homologous*. Moreover, they only grow in situations where such tissue is naturally found. They do not invade the adjacent structures. They do not affect the general health, unless it be accidentally, from their size or position; and when they are once thoroughly removed they show no tendency to return. Such are the marks of a typical non-malignant tumour.

The *malignant* growths, on the other hand, present a complete contrast in all these particulars. They seem to depend in some degree upon a constitutional taint, or an hereditary predisposition. They are unlike anything that is found among healthy structures —they are *heterologous*. They penetrate the neighbouring tissues. They impair the general health. They have a tendency to reproduce themselves in various parts of the body, as well as to return after removal.

But between these two extremes there is an intermediate class, the *cancroid*, *semi-malignant*, or *recurrent* tumours. This class comprises growths which in their earlier stages resemble the benign, but in their later history present many of the characters of malignancy.

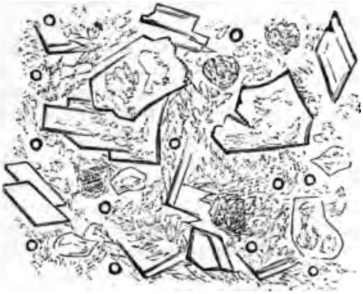
The benign and malignant tumours are not separated by any well-marked line. The two groups shade off into one another. That infinite variety, which we observe in every department of disease, supplies links which unite the two extreme points of the chain.

ENCYSTED TUMOURS

are met with under two forms—(1) Those which consist in the distension and hypertrophy of natural cysts or ducts; and (2) those which result from the enlargement of a primitive cell or of an areolar interspace.

1. To the *first* class belong the *atheromatous* tumours, which are so frequently met with about the scalp, face, and other parts, as the result of obstruction to the ducts of the sebaceous glands. They are situate in the skin, or subcutaneous cellular tissue. They are rounded and smooth in their outline. Their growth is unattended by inflammation, and they are free from pain. They are often found in great numbers in the same individual. They vary from the size of a pea to that of an orange. A few years ago I related to the Pathological Society (see Trans. vol. xx.) a case in which a tumour of this kind, as large as a walnut, was met with in rather an unusual situation—on the free border of the prepuce. Fig. 2 was made from the contents of this cyst. As these tumours grow larger they are apt to soften and ulcerate. But more frequently they are removed before suppuration has commenced. The cyst may be dissected out unopened, or an incision may be made through it, its contents squeezed out, and then the cyst itself is either torn or dissected away. This should be done carefully, so as to leave none of it behind. When there is reason to avoid a cutting operation, the cyst may be

Fig. 2.



Contents of a sebaceous cyst.

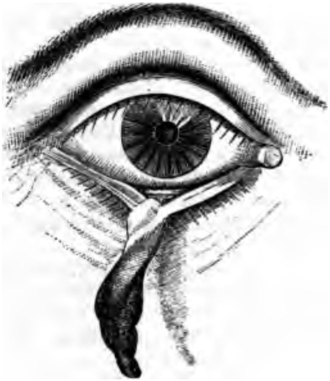
punctured, its contents squeezed out, and the cavity stirred with the point of a probe, or a seton may be passed through it.

The material with which these cysts are filled is made up of the sebaceous secretion, epithelial scales, oil globules, granular matter and crystals of cholesterine.

If the cyst is allowed to soften and ulcerate, it may give rise to a very unhealthy sore. The edges become everted; there is a thin and offensive discharge; coarse granulations spring up, and an intractable ulcer is established, having some of the characters of malignancy.

When a tumour of this kind ulcerates and breaks, some of the contents escape, dry, and form a hard scab. If this is allowed to remain it gradually becomes more and more prominent, by the escape of fresh portions of the contained secretion, and thus in process of time "a horn" is formed. Such horns may be met with on any part of the body, and sometimes they acquire an extraordinary length and developement. Fig. 3. represents such a tumour, which occurred in an old man who was Mr. Bowman's patient at the Royal Ophthalmic Hospital when I was his clinical assistant.

Fig. 3.



Horny tumour on the lower eyelid.

To the same class of encysted tumours belong the dilatations which arise from obstruction of the duct of the parotid gland, or of the lactiferous ducts of the mamma. In all cases of this kind the principle of treatment is simple enough. It consists in re-establishing the natural passage. But in practice this is sometimes no easy matter, and requires much patience and ingenuity on the part of the surgeon. The various affections that have been alluded to will be described hereafter, when we speak of the glands with which they are connected.

Again, to the same class belong the swellings which are formed by the distension of closed cysts. The bursæ, when they are dilated, afford the best example of encysted tumours of this kind. The effusions into the sheaths of tendons and muscles may be regarded in the same light. In these cases the cyst is originally of no more than natural thickness, but gradually, as the disease persists, it becomes tough, and dense, and fibrous. The fluid contained in these cysts is sometimes thick and glairy, sometimes thin and serous. Not unfrequently fibrinous bodies, like melon seeds, are found mixed with the fluid, or attached to the sides of the cavity.

In *treating* these cysts, we endeavour to produce absorption of the fluid by stimulating applications. If this fails, we may tap the cyst simply; or we may tap it and scrape the internal surface, or inject a stimulating fluid; or we may introduce a seton; or, lastly, we may dissect the cyst out.

2. The *second* class of encysted tumours includes those which may be considered new formations, originating in the enlargement of a primitive cell, or an areolar interspace. These cysts vary much in size. Sometimes they attain a great magnitude. They are filled with fluid secreted from their lining membrane. The character of this fluid varies considerably. Sometimes it is thin and serous; at other times it is thick and viscid. Sometimes it is straw-coloured; at other times it is dark brown or green.

These cysts are sometimes *simple*—that is to say, composed of only a single cavity. At other times they are *compound*—the primary cyst containing within it other secondary ones, or solid masses of fibro-plastic material, or of cancer. In some rare and curious cases they have been found to enclose teeth, hair, &c. Compound cysts are generally met with about the uterus, broad ligament, or ovary.

The *treatment* of simple cysts should be conducted on the plan already laid down. We may first try to promote absorption of their contents. If this fails, we may puncture them, and endeavour by various means to excite inflammation within them. Or, as a last resource, we may, if circumstances permit, remove them with the knife.

The treatment of compound cysts is a much more difficult matter. We can hardly hope to effect a cure by any means short of excision; and this is generally such a formidable operation, that it should not be undertaken without great care and forethought.

Cysts are often met with in the substance of other tumours. In such cases they have probably the same origin as in the two varieties that we have described. They arise either from dilatation of existing cavities or canals, or else from the enlargement of primitive cells.

SOLID TUMOURS.

The simplest form of solid tumours that we meet with are *warts*. They are formed by excessive growth of the papillæ of the skin, with an accumulation of epithelial scales. When they are situated on the exposed parts of the body they are hard and dry; when they grow between folds of skin, where the perspiration is retained, they are soft and moist.

Simple warts of this kind are often seen on the hands of children and young persons. But it is more common for the surgeon to be consulted about the warts (*condylomata acuta*) which are often seen on the genital organs as the result of gonorrhœal or other irritation, or upon the mucous tubercles (*c. lata*) which are apt to grow about the verge of the anus, the vulva, and other situations, as a manifestation of constitutional syphilis.

The treatment of simple warts consists in burning them down with caustics. Gonorrhœal warts should be cut off with scissors, and their bases touched with nitrate of silver. Mucous tubercles should be dusted over with calomel, or smeared with a calomel ointment (F. 76), or moistened with black wash.

The true skin sometimes becomes hypertrophied, and rises into a flat tumour of a reddish-brown colour, and with an irregular outline. Such overgrowths are known by the name of *chelis*, or *cheloid tumours*. Sometimes they arise spontaneously, at other times they appear to originate in local irritation. They often commence in a cicatrix, especially the cicatrix resulting from a burn. Their favourite situation is the chest, but they may show themselves anywhere, and when once they have begun to grow they may spread indefinitely. They cause no pain, only uneasiness and disfigurement.

No remedies appear to have any effect upon them. The only treatment that holds out a hope is excision; and even after complete removal they are extremely apt to return.

POLYPUS.

When a mucous membrane becomes inflamed and thickened it may give rise to *polypus*. These tumours are met with in the nose, the pharynx, the uterus, and in fact in almost all the mucous surfaces. Polypi differ widely in their texture, and in the nature of their attachments. The gelatinous polypus consists of an expansion of the normal elements of the mucous membrane. Such a growth as this, springing from a narrow pedicle, forms the simplest kind of polypus. But sometimes fibrous tissue enters more or less into the composition of the tumour, or it may rise from a broad base, adherent perhaps to bone. When these conditions are present, the disease assumes a more serious aspect, and is very prone to degenerate into medullary cancer.

The *treatment* consists in early removal. This may be done in various ways, according to the nature and situation of the tumour. Sometimes the polypus-forceps serve our purpose the best; sometimes the loop of the écraseur, or a noose of ligature, is the most convenient appliance; sometimes we must have recourse to the knife, the gouge, and the bone forceps.

GLANDULAR TUMOURS.

The various superficial glands often become hypertrophied. Such hypertrophy is commonly associated with changes of texture. The lymphatic glands are often affected in this way; so are the mammæ, the testes, the thyroid body, &c. The gland becomes enlarged, though without pain, and presents a tumour which is circumscribed, smooth or lobulated in its outline, moveable, firm, and often elastic to the touch. Sometimes it is callous, at other times tender on pressure.

Tumours of this kind may often be attributed to chronic inflammation. They frequently cause great inconvenience by interfering with the action of adjacent organs or parts. They almost always betoken a faulty state of the general health, and we must deal with them accordingly. If the patient is of a strumous habit, we must give cod-liver oil, or the preparations of iron; while iodine tincture or ointment, or an ointment composed of equal parts of ung. hyd. and ung. iodi, or the emp. ammoniaci c. hyd., or fly blisters, or other resolvent remedies are applied. The ung. hyd. iodidi rubri is held in high estimation by some surgeons; but it must be used with caution. Some of the natural mineral waters—*e.g.*, those of Woodhall in Lincolnshire, and Kreutznach in Rhenish Prussia—are often most beneficial in this class of cases. Chronic enlargements of the cervical glands are common in young persons of a strumous constitution. In such cases the surgeon should be on the alert for the slightest indications of lung disease, for scrofulous glands are often the forerunners of scrofulous pneumonia.

If the enlargement depends upon a syphilitic taint a mercurial ointment should be applied to the part; and at the same time the preparations of mercury or the iodide of potassium should be given internally.

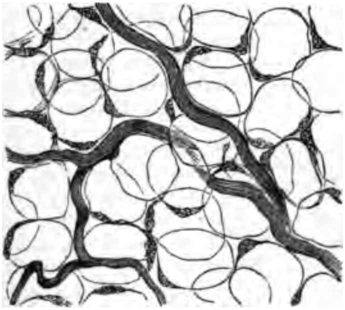
When all other remedies have been found ineffectual, the question of excision may be entertained.

THE FATTY TUMOUR (LIPOMA)

is identical in structure with the healthy adipose tissue. It is generally found in those situations where there is naturally a good deal of fat, as the back of the neck, the shoulders, or the buttocks.

It consists of large polygonal fat-cells crowded together in the meshes of an areolar tissue. Fig. 4, as well as several of the other drawings with which this chapter is illustrated, were taken from preparations which were kindly lent me by my colleague Dr. Mitchell Bruce. The lipoma is enclosed in a fibrous capsule, from which it receives its supply of blood. This capsule gives off septa which divide it into lobules. It is generally free from pain, and causes inconvenience only by its size or situation. It is smooth

Fig. 4.



Lipoma, traversed by a small vein, × 300.

and rounded in shape. It feels soft and doughy; but sometimes, when the capsule is stretched, it is elastic, and may easily be mistaken for a fluid tumour. It is most likely to occur at middle age; and it is not often that we find more than one present in the same individual. It grows slowly but steadily, and may reach an enormous size.

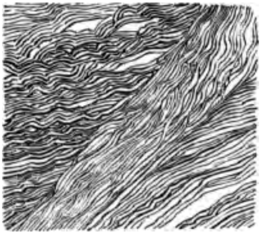
Some cases are on record in which tumours of this kind have been observed gradually to shift their position—for example, from the groin to the perineum, or from the shoulder to the breast. As such movements are always in a downward direction, it is probable that they are caused by the weight of the tumour, and are due to the force of gravitation.

Treatment.—Little or no benefit is likely to result from internal remedies, though the iodide of potassium and the liquor potassæ have been recommended. Removal with the knife is the proper treatment. An incision should be made across the tumour, and then the entire mass, capsule and all, should be torn from its connexions, or separated by a few touches of the scalpel. If this is carefully done, it is highly improbable that there will be any return of the growth.

THE FIBROUS TUMOUR (FIBROMA)

is developed from the connective tissue, and presents the varieties with which all are familiar in that structure. Sometimes it is dense and compact, like tendon; at other times it is looser and more separable. The fibres are sometimes straight, and laid side by side in parallel rows; at other times they are wavy and interlace in every direction. For the specimen from which Fig. 5 was drawn I am indebted to my colleague Dr. T. Henry Green. Like the normal fibrous tissue, these tumours are very sparingly supplied with vessels. If we except the so-called fibrous tumours of the uterus (which are really composed in great part of unstriped muscular tissue), their most frequent seat is the neck; but they also grow elsewhere—in the breast, or attached to the periosteum in various situations. They often occupy the antrum, and give rise to great disfigurement. They are hard and inelastic to the touch. Their outline is

Fig. 5.



Fibroma, × 300.

smooth and lobular, and they are usually enclosed in a capsule. They grow slowly, and are attended by little or no pain. They may attain a great size. They belong to the middle and later periods of life. It is seldom that we find more than one in the same subject.

As they advance they may degenerate and become infiltrated with earthy salts; or cysts may be developed in their interior; or they may inflame and suppurate, ulcerating through the skin, and giving rise to a foul and offensive sore.

THE NEUROMA

is a tumour connected with a nerve or its sheath. The substance of it is fibrous. In shape it is generally rounded or oval, and it may attain the size of a cocoa-nut.

It is commonly multiple. It is harmless in its nature, but it gives more or less inconvenience by the pressure it exerts upon the neighbouring parts. Sometimes it is callous and free from pain; in other cases it is very painful and sensitive to the touch. Everything seems to depend upon the exact relation it bears to the nerve with which it is connected.

Extirpation is the only *treatment* that is likely to be successful.

The *painful subcutaneous tumour* must be distinguished from the foregoing. It is generally single, and it gives rise to exquisite pain, though it does not appear to be connected with any nerve of appreciable size.

These tumours should be excised at an early period of their growth, for they are not amenable to any milder treatment. As a rule they are not liable to return.

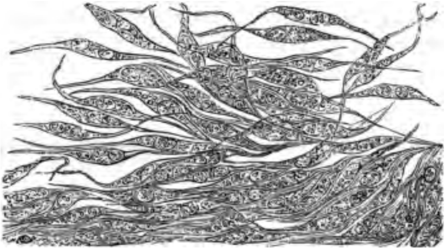
THE SARCOMATA.

The group of new formations which were formerly called *fibro-plastic*, *fibro-cellular*, and *fibro-nucleated*, and which constitute the semi-malignant or recurrent class of tumours, are now usually spoken of as *sarcomata*. They are essentially connective tissue growths, the connective tissue undergoing rapid development, but always retaining its embryonic structure, and never reaching maturity. They are all made up chiefly of cells, together with a small but variable proportion of intercellular substance, and it is by the prevailing character of their cells that they are usually classified. Thus they are divided into (1) *spindle-celled sarcoma*, (2) *round-celled sarcoma*, and (3) *myeloid sarcoma*.

1. The *spindle-celled sarcoma*—the fibro-plastic tumour of.

earlier writers—bears a close resemblance to the fibroma. It consists of fusiform cells, ranged closely together in parallel rows, which traverse the growth in various directions. In Fig. 6 they have been fretted out so as to bring some of the individual cells more clearly into view. They often begin in the subcutaneous cellular tissue, or in the cellular tissue of the mamma and lymphatic glands. Not unfrequently they have a deeper origin, and spring from the periosteum, more especially of the facial bones. They grow more quickly than the fibrous tumours, and are attended by more pain. They occur chiefly about middle life, and are usually single. They may attain a very large size.

Fig. 6.



Spindle-celled Sarcoma, × 300.

2. The ***round-celled sarcoma*** is softer and more vascular than the preceding. The cells are small and round, and there is little or no intercellular substance. They grow rapidly, and extend by invading the adjacent connective tissue. This sarcoma bears a general resemblance to the encephaloid variety of cancer, but is distinguished from it by the want of a fibrous stroma, by the uniformity of its cells, and by the mode of its extension along the lines of areolar tissue.

3. The ***myeloid sarcoma,*** like the two preceding varieties, consists of embryonic connective tissue, but it is distinguished by the large irregular mother-cells which it contains. These cells are merely the cells of the medulla (μυελὸς, the spinal marrow) in a state of excessive activity. And this fact points to one of the peculiarities of the myeloid tumours—namely, that they always originate from bone, and almost always from a medullary cavity. Some examples of epulis belong to this class; so do many of the tumours that we see connected with the ends of long bones. They generally have a capsule derived from the periosteum of the bone from which they spring. They are sometimes so vascular

as to pulsate and give rise to an aneurismal bruit. If they are punctured they bleed freely.

As a group the sarcomata approach in some of their characters to the cancers. Thus they extend along the planes of cellular tissue, invading the adjacent parts, and they are apt to recur after removal, as well as to reproduce themselves in internal organs, through the dissemination which takes place in the blood. They are the new formations (to which early life is most subject), and they are very fatal. They are therefore malignant diseases, though histologically they are distinguished from cancers. Besides the difference in their microscopical characters they are contrasted with the cancers by not infecting the lymphatic glands, and not invading other tissues than the areolar. The softer and more vascular the species of sarcoma the more rapid will be its local development, and the more readily will it disseminate itself throughout the body by means of the circulation.

Speaking generally the sarcomata have a smooth rounded surface; sometimes they are hard to the touch, at other times elastic; sometimes they have auniform consistence, at other times the same tumour presents both hard portions and soft. They often grow to a large size. If the skin breaks they may ulcerate, and the patient be worn out by an exhausting discharge, by pain and by discomfort.

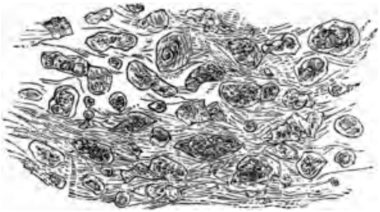
No treatment short of excision is of any avail; and even after they have been removed they are extremely apt to recur again and again. In operating upon them the surgeon should cut wide of their apparent circumference, so as to take away all the areolar tissue that may be in the least degree affected, and the wound should be washed out with strong chloride of zinc lotion. (F. 25.)

ENCHONDROMA.

The cartilaginous tumour (enchondroma) is, in its simplest form, almost identical with fœtal cartilage. On section it presents a hard shining surface, of a bluish-white colour. Under the microscope it is seen to consist of a stroma, which may be hyaline, granular, or slightly fibrillated, and in which there are large, round, oval, or caudate cells, containing nuclei. (Fig. 7.)

It is developed from connective tissue and is often associated with the periosteum, especially of the bones of the hand; but it may also occur in the soft tissue of glands—for example, in the parotid, or in the testicle. Its outline is smooth and nodulated. It feels firm and slightly elastic to the touch. It often appears in childhood or about the early period of adult life, and it is no uncommon thing to see several tumours growing near one another. At first it progresses slowly, and is unattended with pain. But if it is allowed to remain, it involves the skin and ulcerates; and the result is an intractable sore, which has something of a malignant aspect.

Fig. 7.



Enchondroma, × 300.

The only remedy is removal. If circumstances permit, the tumour should be thoroughly extirpated. If it is attached to bone a resection, or perhaps even an amputation, will generally be requisite.

BONY TUMOURS.

A deposit of osseous matter having more or less the characters of true bone, sometimes takes place in the substance of fibrous or other tumours.

Again, an enchondroma sometimes becomes developed into bone.

But it is more common to meet with osseous tumours springing directly from bone (exostosis). Such growths occur under two conditions—either they are dense in texture, like ivory; or they are composed of cancellated tissue. They will be more fully considered hereafter when we come to speak of the diseases of bones.

THE CANCERS—CARCINOMATA.

We come now to that group of malignant diseases which is distinguished by the name Cancer or Carcinoma, and which includes four varieties—Scirrhous, Encephaloid, Epithelioma, and Colloid.

The cancers are new formations of an epithelial type, and consist of cells, compacted together without any intercellular substance and lying in the spaces of a fibrous stroma. They are heterologous, that is to say, the elements are alien to the situation in which they are found, and they present in a high degree the clinical marks of malignancy—*i.e.*, they invade the surrounding structures, they impair the general health, they are apt to return after removal, and they give rise to secondary deposits in various parts of the body.

The cells that are met with in cancers vary much, for they represent all the varieties of epithelium, both when it is fully developed and while it is in process of formation. But if the tumour is examined at a spot where the cells are fully formed, but have not yet begun to undergo retrogressive changes, it will be found that they are like the epithelium of the part in which the growth originated. Thus the cells may be large or small, regular or irregular in outline. They may be round, or oval, or pyriform, or caudate—the exact shape depending much upon the degree of pressure to which the elements of the growth have been subjected. Some are simple; others are compound, and contain two or three complete cells within them, with nuclei and nucleoli. When degenerative changes have commenced—and such changes are very common in morbid growths of this kind—the cells are often loaded with oil-globules and granular matter.

All the cancers, inasmuch as they are apt to affect the organs of digestion and assimilation, are sometimes attended by the leaden hue, the emaciation, and the deep dejection to which the older writers gave the name of the "cancerous cachexia." But in truth there is no cachexia peculiar to cancer. Some persons suffering from this complaint present a very healthy appearance; while, on the other hand, many patients affected with organic diseases of very different kinds exhibit in a marked degree the symptoms to which I have alluded.

Scirrhous or *hard cancer* is a disease of adult life. It occurs in two forms: (1) as a close compact mass; and (2) infiltrated through the substance of an organ or tissue. In either case it gives rise to a rough, irregular tumour of almost stony hardness.

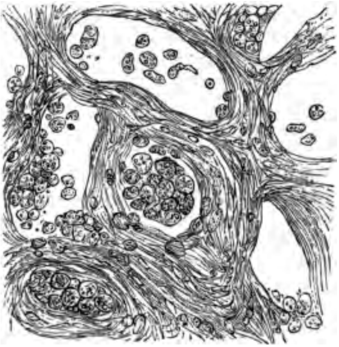
It is three times more common in women than in men. It often attacks the uterus, but still more frequently the female breast. A small lump is detected, perhaps as large as a marble. Slowly, but surely, it increases in size; and as it grows it draws to itself, by a kind of concentric contraction, the surrounding structures. The skin becomes puckered, and the nipple retracted. There is pain of a shooting, darting character. Still the tumour moves freely between the skin and the subjacent muscle. Presently adhesions are formed. In front the skin becomes involved; while behind the disease attacks the pectoral muscles.

Enlarged lymphatic glands may be felt in the axilla, which are distinctly connected with the tumour by a line of swollen absorbents. Gradually the skin covering the tumour turns to a purple or bluish colour, breaks, and ulcerates. An unhealthy and offensive discharge commences. The pain becomes more acute and more constant. The patient's general health begins to suffer. She grows sallow, loses flesh, and becomes dispirited. Secondary deposits are formed in other parts of the body, very probably in the lungs or liver; and she at length sinks, worn out by incessant pain and profuse discharge, or by the damage done to some vital organ. (See Fig. 97.)

The secondary cancer is not necessarily of the same variety as the primary disease which gave rise to it. Thus, scirrhus of the breast may lead to encephaloid of the liver or lungs. The same general rule holds good of all cancers.

If a section is made of a scirrhous tumour, it is so dense and tough, that it creaks as the knife passes through it, and the cut surfaces present a white, glistening, satiny appearance, intersected by bands of fibrous tissue. If a thin section is examined under the microscope it presents the appearances depicted in Fig. 8. —an abundant fibrous stroma containing cells of an epithelial type. If the cut surface of the tumour is scraped, the fluid thus obtained—the cancer-juice—will be found to contain these cells, and thus far will furnish an indication of the nature of the disease.

Fig. 8.

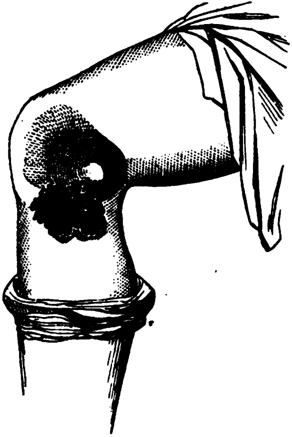


Scirrhous cancer, × 300.

The *encephaloid, medullary,* or *soft* cancer is the acutest and most malignant variety of the disease. It differs from the foregoing chiefly in the rapidity of its growth, and the scantiness of its fibrous stroma. It is met with in many situations where scirrhus is unknown: it often attains an enormous size, and sometimes bleeds freely.

It begins as a soft, smooth, lobulated tumour, somewhat elastic to the touch, and not unlikely to be mistaken for fluid. It increases apace, making its way towards the surface. The skin covering it is marked by dilated veins, and is sometimes even œdematous. When it has reached this point, it very soon involves the skin, ulcerates, and bursts forth in the form of large fungoid protrusions, from which there escapes an offensive discharge. The tumour is very vascular, and if any obstruction to the return of blood occurs, either from constriction at the point of protrusion, or from any other cause, bleeding is very apt to take place. Such appears to be the pathology of that variety which is known as *fungus hæmatodes*, and which consists of nothing but the soft, spongy, encephaloid tissue, surcharged with blood (Fig. 9). In these very vascular tumours pulsation may sometimes be felt, and a bruit detected with the stethoscope. This has been particularly noticed when the disease is connected with bone.

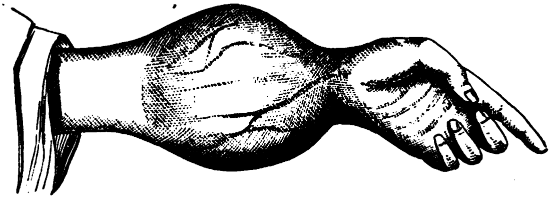
Fig. 9.



Soft cancer surcharged with blood—*fungus hæmatodes.*

Encephaloid cancer may occur at any age. It is often met with in young children. It may show itself almost anywhere; but its favourite seats are the orbit, the nasal cavities, the mamma, the testicle, the bones, and the viscera.

Fig. 10.



Encephaloid cancer in the forearm.

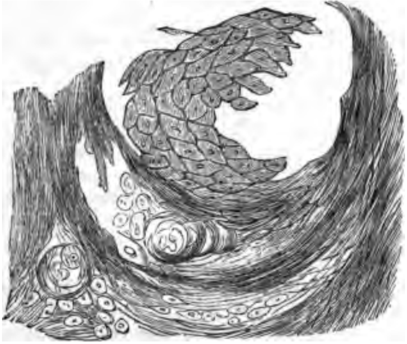
To the naked eye it has the appearance of brain-substance. It contains an abundance of the cancer-juice, and but little fibrous tissue. Under the microscope its cells are found to be irregular in outline, imperfectly formed, and loosely arranged, and very prone to fatty degeneration. It disseminates itself rapidly, and soon leads to a fatal termination.

Fig. 10 was taken from a young woman, aged 27. The tumour had been growing two years; and, as it had resisted all ordinary treatment, amputation was recommended.

The third variety of cancer is that which is known as *epithelioma* or *epithelial cancer*. Both histologically and clinically it differs somewhat from the varieties already described; so much so that some writers have regarded it as not being of a cancerous nature. But when it shows itself in a soft and moist tissue—*e.g.*, the tongue—it presents all the clinical features of the most malignant cancers; and when it occurs on external parts it can only, at the best, be regarded as rather a milder and more chronic form of the disease.

Histologically it is distinguished by the fact that it almost always originates in a mucous or cutaneous surface; and by its cells having the type of squamous epithelium. As these cells multiply they arrange themselves in globular masses. The outer cells of these masses become flattened by the pressure of the surrounding tissues, while those near the centre retain their expanded form. These are the laminated capsules, the concentric globes or nests of cells, which are characteristic of epithelioma (Fig. 11). In the older parts of the disease these globes will be found compressed into dense masses where no cellular arrangement is visible, while in the oldest portions they present only the appearance of granular débris in the interspaces of an abundant fibrous tissue.

Fig. 11.



Epithelioma; laminated capsules, × 200.

Epithelioma appears to originate in an excessive growth of the papillæ of the skin or mucous membrane, and of the epithelium covering them. Sometimes, however, it commences among the deeper tissues. As a general rule it advances slowly at first. For years it may remain inactive, making little or no progress. Then it may begin to grow more rapidly, springing up in the form of warts, tubercles, cauliflower excrescences, &c. Cracks and fissures appear on the surface. The pain, which was before occasional and trifling, now becomes constant and acute. The patient's health begins to suffer. The surface of the tumour ulcerates and gives rise to an offensive discharge, while the disease spreads apace, invading the surrounding tissues, and extending to the neighbouring lymphatic glands. In some rare instances it has given rise to secondary deposits in other parts of the body.

Epithelial cancer is most frequently seen upon the muco-cutaneous surfaces, the lips, the anus, the penis, the labia, &c. But it is not confined to these situations. It may begin almost anywhere, in any part of the skin or mucous membrane, in the lymphatic glands, or even in the bones.

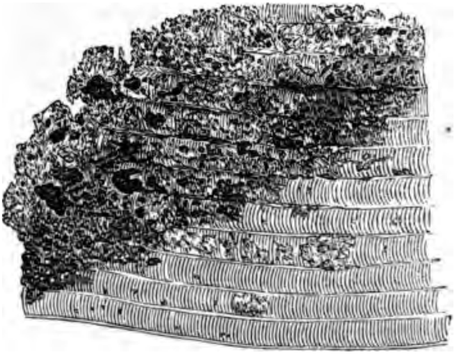
There is sometimes an hereditary predisposition to epithelioma, and, when such is the case, long-continued local irritation seems to determine its seat—as, for example, the smoker's cancer of the lip, and the chimney-sweep's cancer of the scrotum. Acrid discharges, or a want of proper cleanliness, may have something to do with its frequent occurrence about the labia or anus. It has long been observed that those who have congenital phimosis are more liable than others to epithelial cancer of the penis; no doubt in consequence of the irritation caused by the retained secretion.

The variety of cancer called *villous* may be regarded as epithelioma attacking mucous surfaces—for example, the lining membrane of the mouth or bladder.

Colloid or *gum cancer* consists of an alveolar bed, formed of fibrous tissues arranged in large circular outlines, and filled up with semi-transparent mucoid substance. It has but few vessels, and grows slowly. The cells of which it is composed are large, spherical, and filled with the same gelatinous material in which they are imbedded. It would seem that they are too large to travel easily through the lymphatics; and hence this form of cancer does not readily disseminate itself. It is a disease of adult life. It is most frequently seen in the intestines; though it may occur elsewhere, and is sometimes found blended with masses of medullary cancer. It may be regarded as forming the link between the cancers and cystic disease of the ovary.

Melanosis.—Some examples of cancer—more particularly those which spring from the choroid or skin—are distinguished by the presence of pigmentary matter, and some writers have described these as a distinct variety under the name of *black cancer.* But their growth and development is essentially the same as that of the other cancers, only their cells retain the power of selecting

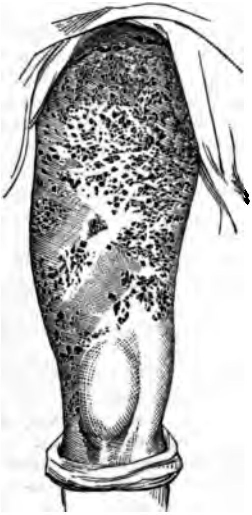
Fig. 12.



Melanosis infiltrating muscle, × 300.

pigments from the blood—a power derived from the tissue in which they originated. The pigment is scattered throughout the mass in the form of minute granules, which gradually coalesce and become small masses (Fig. 12). In other respects the growth closely resembles encephaloid. Of this we have a remarkable proof in the fact that a pigmented cancer, springing from the choroid, may be black within the globe of the eye, and white (ordinary encephaloid) when it has burst through the coats. The disease may be confined to a single spot, or it may gradually disseminate itself until it has invaded a wide area and implicated many organs. Fig. 13 is taken from a case which I had the opportunity of watching from beginning to end. The patient was a woman, aged 47. The disease commenced in a mole on the third toe of the left foot. Two years and a half from the time when she first began to feel irritation and pain, the thigh was in the condition represented. It was stained almost all over a uniform grey colour, and speckled with an infinite number of black nodules, like small shot. Four months later the patient died, and it was found that all the muscles of the left thigh, as well as the lymphatic system generally, and the liver and lungs, were infiltrated with the disease. Fig. 12 was made from the left sartorius muscle.

Fig. 13.



Diffuse melanosis of the thigh.

The *diagnosis of cancer* is not always easy, especially in its earlier stages; and yet it is a disease which it is of great importance to detect, before it has made much progress. Scirrhus may generally be distinguished by paying attention to its situation, its hard, nodular outline, the age and sex of the patient, the stabbing character of the pain, the retraction of the surrounding tissues, the implication of lymphatic glands, and the impaired state of the health.

In the case of encephaloid disease, the diagnosis is more difficult. It is more likely to be confounded with other tumours, and we have fewer points to guide us. Still, the rapidity of growth, the smooth, uniform aspect of the tumour, with dilated veins coursing over it, and, if need be, a microscopical examination of its contents, will go far to establish its nature.

The *causes of cancer* are very obscure. To a certain extent it is an hereditary disease. The tendency to it appears to increase steadily as age advances. In some instances it would seem that the predisposition is called into activity by a blow or a wound, or a long-standing irritation. But much more often it cannot be traced to any cause. In the majority of cases it has a constitutional origin, and that of so subtle a nature that we are as yet unable to grasp it.

Treatment of Cancer. — Constitutional treatment, however useful it may be in improving the patient's health, and mitigating his sufferings, has no power to disperse the tumour, or to arrest its growth.

Our only hope of effecting a cure lies in early and complete removal. Yet it is seldom indeed that a cancer can be said to be cured by extirpation. In most cases all that can be done by this means is to promote the patient's comfort, and to prolong his life. If the disease is very extensive, ramifying among important parts, or if the patient's health is much impaired, or if there is reason to think that vital organs are secondarily affected, removal can hardly be thought of.

But supposing an operation to be admissible, what means shall we select in performing it? Either the knife, the écraseur, the ligature, or caustics may be used. Undoubtedly, as a general rule the best method is excision. If the tumour is small, it may be easily removed by the knife, under chloroform; and the clean-cut surfaces may unite by adhesive inflammation, or be left to granulate.

If, however, the patient should object to any cutting operation, we may propose the use of the écraseur, or of the ligature, or of caustics. But it is only a small proportion of cases that are suitable for these means.

Many ways have been proposed for destroying cancers by caustic, and various agents have been tried. Of these the best is the sulphate or chloride of zinc, applied either in the form of powder or paste, or in the shape of "caustic arrows." These consist of the caustic made into a paste with flour, baked to hardness, and then cut into small-pointed strips. They may be inserted into or around the tumour, through punctures in the skin. The pain which is given by caustics varies much. Sometimes it is not great; at other times it is agonizing.

Narcotics are invaluable in alleviating pain and procuring sleep. Opium, conium, or henbane may be given freely. (F. 43.)

Tonics may do much to improve the patient's general health and to enable him to resist the disease. The preparations of iron, quinine, or cod-liver oil should be prescribed; while at the same time care should be taken that the patient has a generous diet, combined with moderate exercise in the open air; and he should be advised to avoid all such use of the part as tends to keep up local irritation.

SCROFULA, STRUMA, AND TUBERCULOSIS.

Scrofula (or struma) is the name given to a constitutional affection of whose essential nature we are ignorant, but which evidently depends upon a deficient or depraved nutrition, and which declares itself by certain outward marks. It is most prone to appear in early life. Its symptoms are slow and insidious in their progress, but afford unmistakable evidence of debility.

Though it may occur in almost any one, it is chiefly met with in individuals of two very different aspects :—(1). The *sanguine*—with clear complexions, delicate features, graceful outlines, fine skins, large lustrous eyes with long silky lashes, and quick, lively intellects—children who are beautiful in person, precocious in mind, and almost unnaturally good and docile. Wordsworth seems to be describing such a child when he says—

> "I see the dark-brown curls, the brow,
> The smooth transparent skin,
> Refined as with intent to show
> The holiness within."
> ("Jewish Family at St. Goar.")

(2). The *phlegmatic*—with muddy complexions, coarse features, thick lips, dull heavy eyes, large joints, and awkward, stunted, or deformed figures. In persons of this temperament the intellectual faculties are sometimes obtuse, sometimes capable of great and sustained exertion. It has been customary to point to Dr. Samuel Johnson, the lexicographer, as a type of this class. Boswell tells us that even in early life "his immense structure of bones was hideously striking to the eye, and the scars of the scrofula were deeply visible."

These external characters are accompanied by a weak, irritable, and imperfect digestion, a feeble circulation, a relaxed state of the muscles, and a tendency to derangements of health.

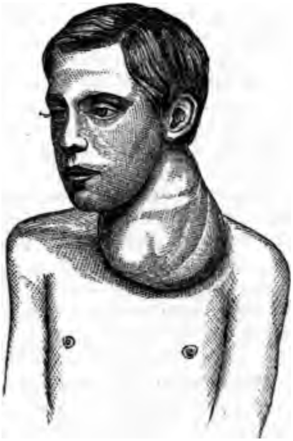
The scrofulous constitution is often inherited; but it may also be produced by unfavourable conditions of life, as a want of proper nourishment, fresh air, clothing, exercise, &c.

The parts where it most frequently shows itself are the bones, the joints, the lymphatic glands, the skin, and the eyes. In internal organs it gives rise to diseases which fall under the care of the physician, such as phthisis pulmonalis, or tabes mesenterica.

In the skin, the cornea, and the mucous membranes it occasions a low and unhealthy inflammation, with ulceration; while in the lymphatic glands and bones it leads to chronic inflammation, the deposit of tubercle, and suppuration.

The accompanying illustration (Fig. 14) represents chronic enlargement of the cervical glands in a strumous boy, aged 14, who was under my care at Charing Cross Hospital. As it is the cancellated structure of bones which is most liable to suffer the neighbouring joints are in great danger of being secondarily affected. Sometimes the scrofulous disease appears to begin in the joint itself, and to spread to the adjacent bones.

Fig. 14.



Chronic enlargement of the cervical glands.

Such being the habit of body in scrofulous persons a very slight cause is sufficient to determine some manifestation of the disease. Thus a sprain may be followed by disease of the joint, a long walk by enlargement of the inguinal glands, or the irritation of dentition—more particularly the eruption of wisdom teeth—by the enlargement of those in the neck.

Tubercle is the morbid material which is deposited in lymphatic glands, bones, internal organs, or elsewhere, as a result of strumous disease. Its essential nature and the mode of its production are involved in much obscurity. It would appear, however, to be a degraded form of plastic material, the result of an affection of the lymphatic system, produced by faulty and perverted nutrition.

Tubercle is met with under two forms—either as minute beads of a grey, semi-transparent appearance and a firm consistence; or as a soft, yellow, opaque substance like cheese. The "grey granulations" seem to be nothing more than the early stage of the "crude tubercles."

Under the microscope tubercle presents a homogeneous mass, in which are seen some imperfect cells.

Chemically it consists of albumen, phosphate and carbonate of lime, together with a little oil.

Tubercle is never organized, and never entirely absorbed. In a few fortunate cases it withers into a dry and chalky substance; but in the great majority of instances it softens, suppurates, and gives rise to abscess.

The *treatment of scrofula* is partly constitutional and partly local. It has been said that the disease is one of debility and faulty assimilation. Everything, therefore, must be done which can promote digestion and nutrition, and improve the general health. By careful attention to this rule the active manifestation of the disease may be prevented, even in those who have an hereditary tendency to it. The patient should live in a pure atmosphere—if possible, in an elevated situation, or at the seaside. He should have plenty of sun-light,

> "Since light so necessary is to life,
> Nay, almost life itself."
> (Milton's "Samson Agonistes.")

His diet should be plain but nutritious, including a large proportion of animal food, and given with regularity. His clothes should be sufficiently warm, and he should be encouraged to take a moderate amount of exercise in the open air. The surgeon must pay attention to the state of the skin and of the secretions. A mild aperient or alterative should be given occasionally; and, if other circumstances permit, a cold, tepid, or sea-water bath should be used every morning. At the same time the preparations of iron, or of iodine, or cod-liver oil may be prescribed with great advantage. Some natural mineral waters—more particularly those of Woodhall in Lincolnshire and Kreutznach in Rhenish Prussia—are often of great service in the treatment of scrofulous cases: while in many instances a sea voyage is the best thing that the surgeon can recommend.

The local treatment must vary according to the particular form and stage of the disease. The inflammation, both before and after suppuration has taken place, must be treated on the same principles which guide us in dealing with inflammation generally. But after all that can be done there are a few obstinate and inveterate cases which will remain, as they were in Shakspeare's time, "the mere despair of surgery" (Macbeth iv. 3)—cases in which some of the larger joints are diseased, or in which the whole extent of a limb is riddled with sinuses, and for the cure of which nothing short of a severe operation—an excision or an amputation—will suffice. When, however, the patient's constitution is impaired, and his strength undermined by long-continued suffering, he is not of course in a very favourable condition for undergoing any operative treatment.

PART II.

INJURIES.

ARREST OF HÆMORRHAGE.

Hæmorrhage is of three kinds—*arterial, venous, and capillary.*

In arterial hæmorrhage the blood leaps forth in bright, red jets. In venous hæmorrhage it wells out in a dark purple stream. In capillary hæmorrhage it oozes from the general surface. We shall speak of each of these three varieties in turn.

ARTERIAL HÆMORRHAGE.

It will be well to study, first, the natural, and second, the artificial arrest of hæmorrhage.

Natural arrest.—This must be considered under two heads—(1) the temporary, and (2) the permanent arrest of bleeding.

1. When an artery is cut across its coats both *contract* and *retract.* They contract so as to reduce the size of its orifice, and diminish the jet of blood. They retract so as to leave the sheath projecting beyond them. On the rough areolar surface of this sheath, as well as in the extremity of the vessel itself, the blood is arrested, and forms a coagulum. This coagulum occludes the mouth of the artery. In some cases there are other circumstances which come to our aid. As hæmorrhage proceeds, the force of the heart decreases, while at the same time the blood itself becomes more and more disposed to coagulate. These are the means by which bleeding is temporarily arrested.

2. From the cut edges of the artery plastic material is poured out, which blends with the fibrinous clot, and gradually the whole becomes vitalized. By degrees the colouring matter of the coagulum is absorbed, and the fibrine alone is left.

Within the artery itself the blood stagnates, and the fibrine is deposited—forming the "internal coagulum." This is of a conical shape with the apex directed upwards. At the same time fibrine is also deposited on the lining membrane of the artery adjacent to the cut end. This is sometimes called the "secondary internal clot." The arterial coats continue to contract upon the "internal coagulum," and become adherent to it, the "secondary internal clot" blending with the "internal coagulum." The fibrine of this coagulum becomes gradually organized into fibro-cellular tissue, and after the lapse of time nothing is left but a fibrous cord. These are the means by which the artery becomes permanently occluded.

When an artery is torn across the arrest of hæmorrhage takes place somewhat differently. The two inner coats yield to the lacerating force before the outer one gives way. The outer one is thus drawn to a point beyond the two inner ones. In this way a double barrier is formed to the passage of the blood; first by the outer coat, and secondly by the sheath, as in the former case. A conical clot with its apex downwards forms in the space between the two inner and the outer coats; while, as before, an "internal coagulum"—a conical clot with the apex upwards—forms in the channel of the artery itself, The subsequent changes are the same as in the former case.

When an artery is wounded, or partially divided, it is important to observe how nature provides for the arrest of hæmorrhage. The blood which is poured out at the aperture lodges in the sheath and adjacent tissues, coagulates, and presses upon the artery. By this means the calibre of the vessel is reduced, and its position relatively to the wound in the skin is somewhat altered. Thus the hæmorrhage is temporarily arrested.

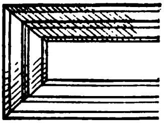
Permanent closure takes place by adhesive inflammation in the wound itself. But in many cases the effusion of plastic material is so great as to lead to the entire occlusion of the artery. A longitudinal incision will always heal more favourably than a transverse one. When the wounded artery is of large size union by adhesion can hardly be expected. A traumatic aneurism will usually be the result of such an injury.

Artificial arrest.—The surgeon has various means at his disposal for stopping the flow of blood. He need, therefore, never fear hæmorrhage, provided the bleeding point is within his reach, for then it can always be controlled, at any rate for a time.

The *position* of the part should be studied; the seat of injury being raised as high as possible above the level of the heart.

Cold is very useful in constricting the vessel. It may be enough merely to expose the wound to the air; or cold water or ice may be applied according to circumstances, *Pressure* may be employed by means of the fingers, a tourniquet, or a graduated compress, according to the nature of the case and the situation of the vessel. A graduated compress (Fig. 15) is formed of several folds of lint laid one on the top of the other, each fold being a little smaller than the one below it. In this way a pyramidal pad is made, and when it it is applied the apex is directed downwards and placed just over the point upon which the surgeon desires to exert the greatest amount of pressure. The pad, or compress, may be of any shape that suits the part; or of any thickness, according to the amount of force which we wish to use; for the greater the thickness the greater will be the degree of pressure that it is capable of exerting.

Fig. 15.

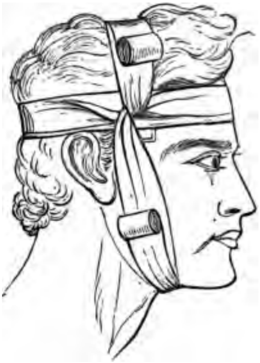


If such a compress is secured by a *nodose bandage* it is capable of exerting a great degree of force.

The nodose bandage (*nodus*, a knot) is perhaps most frequently applied to the temporal artery, and we shall describe it as it is used in this situation; but it may be modified to suit various localities, and it may often be employed as a sort of extemporized tourniquet to make deep pressure upon a particular spot.

It requires a double-headed arm-bandage, and a graduated compress. The compress is first laid upon the temple, on the spot upon which it is desirable to exert the pressure. The central portion of the bandage is then applied over the compress, and the two rollers are carried horizontally round the head, one to the right hand and the other to the left, to the opposite temple, where they cross one another, and are brought round again to the compress. They are now twisted upon one another, forming a knot over the compress, and being turned so that one may be conducted over the head and the other under the chin to the opposite temple. Here they meet and cross one another, and are brought round again to the compress. (Fig. 16.) Having arrived at the compress, they are again twisted upon one another,

Fig. 16.



Nodose bandage.

so as to make another knot. The operator is now enabled to carry the roller horizontally round the head as at the first turn. When as many twists as are necessary have been made over the compress, the bandage may be finished off with two or three circular turns round the head.

The twists or knots, from which the bandage takes its name, should all fall upon the graduated compress, and if they are rightly applied they are capable of exerting a great degree of pressure. The bandage may be secured on the opposite temple by passing one or two pins through the point where the horizontal and vertical folds cross one another.

Styptics.—Various substances are employed as styptics. Some of these act by coagulating the blood, others by constricting the coats of the vessels. To promote the coagulation of the blood, to give it a fine mesh-work whereupon the fibrine may be deposited, it is a popular practice to apply some cobwebs, or a little fretted blotting-paper to the bleeding surface. The use of the former is alluded to in Shakspeare's "Midsummer Night's Dream," where Bottom says to the fairy named Cobweb, "I shall desire you of more acquaintance, good master Cobweb. If I cut my finger I shall make bold with you." Such applications as these imitate the natural hæmostatic process wherein the blood coagulates upon the rough areolar sheath of the divided artery. Of the styptics which act by their astringent power upon the coats of the vessels the most useful are the perchloride of iron, gallic acid, alum, zinc, and matico.

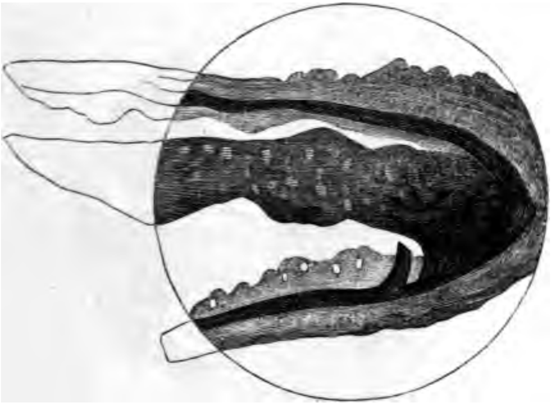
The *actual cautery* is a certain, though a severe, means of stopping bleeding. It acts by coagulating and hardening the tissues. It is particularly suitable to some situations where it is difficult to apply ligatures—the interior of the mouth, for example. The lunar caustic has the same effect, only its action is more superficial.

Torsion.—The bleeding artery may be seized with a forceps, drawn gently forwards, and twisted two or three times. The part that is included in the forceps should not be twisted completely off. It does not slough, so that there need be no fear that it will act as a putrefactive foreign body. When torsion is employed in this way, the effect is to rupture the two internal coats of the artery, which become more or less incurved by their own elasticity, while the external coat is folded over the end of the vessel.

Fig. 17 illustrates this point. It is taken from a microscopical section which I obtained when making experiments on the carotid of a rabbit. The artery had been closed by torsion. The ruptered, retracted, and incurved inner coats are well seen, as well as the internal coagulum and the secondary clots.

Torsion has long been practised upon small arteries, and for such all surgeons are agreed that it is a good method. But in the case of large arteries—*e.g.*, the femoral or the brachial—it seems neither so convenient nor so safe as the ligature.

Fig. 17.

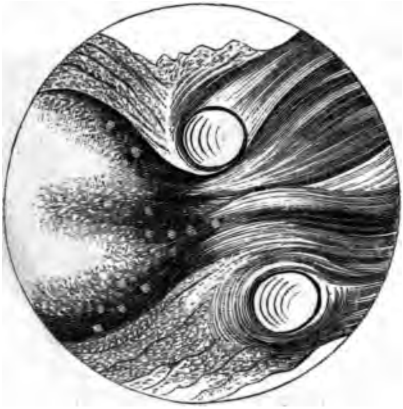


Artery closed by torsion, × 60.

Acupressure was recommended to the profession a few years ago by Sir James Simpson, as a means of arresting hæmorrhage. It consists in passing a needle across the artery, through the tissues, and making pressure upon it by the elasticity of the tissues themselves. As a general practice acupressure has not met with much favour. It is open to the great objection that it only presses together the sides of the divided artery and does not rupture the two inner coats, upon which so much of the safety of the patient depends. There are, however, some situations in which it is extremely useful—*e.g.*, there is no readier way of stopping the bleeding from a superficial artery, such as the radial or ulnar, than by passing a needle across it so as to compress it.

The safest and most convenient way of stopping the flow of blood from an artery is to put a *ligature* upon it. When an artery presents itself upon a cut surface it is to be seized with a forceps, drawn gently forward, and a ligature passed round it. The ligature should then be tied with a reef knot, and one of the ends cut off. It is usual to employ hempen ligatures, but from time to time various substances have been tried in the hope of finding something which would not act as a foreign body, but would gradually undergo liquefaction and absorption. With this object Mr. Lister has recommended carbolized catgut. Fig. 18 represents a thin section of the carotid artery of a rabbit twelve hours after it had been ligatured with carbolized catgut. The clear homogeneous circles are the ligature cut transversely. On the left of the drawing the earliest stages in the formation of the internal coagulum and the secondary clots are well seen. When any material like catgut is used both ends are cut off short, and the surgeon aims at healing the wound as rapidly as possible, leaving the noose and knot to be absorbed. When the ligature is drawn tight the internal and middle coats of the artery give way and turn inwards, while the external one is drawn over the orifice. An internal coagulum immediately begins to form in the channel of the vessel, and plastic lymph is poured out from the divided coats of the artery, both on the distal and proximal sides of the ligature, which helps to agglutinate and close the opening.

Fig. 18.



Artery closed by catgut ligature, × 60.

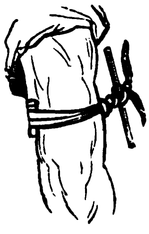
When a vessel has been completely severed by a wound both the cut ends should be secured.

When called to a case of hæmorrhage the first thing the surgeon should do is to remove all bandages, dressings, &c., and to see exactly from whence the bleeding proceeds. Sometimes the mere exposure of a wound to the air may do much to arrest the norrhage. If blood is flowing fast the surgeon should apply a rniquet, or direct an assistant to compress the main artery ve the seat of injury, while he removes the clots, and sponges ; the wound. If there is a jet of arterial blood he should take the bleeding point with a forceps, and have a ligature thrown ound it. If the hæmorrhage consists in a general oozing from the t surface, the part should be freely exposed to the air, and well shed with a stream of cold water, and then pressure should be plied by means of a pad and bandage. If the blood is welling up m the bottom of a punctured wound, local pressure by means of a aduated compress should be tried, and at the same time a rniquet should be applied to the main artery above the seat of ury. If these means fail, the wound must be enlarged and th ends of the bleeding vessel secured. If this is found im- cticable, the artery must be tied in the upper part of its rse.

Whenever it is possible the surgeon should tie the bleeding vessel the seat of injury. He is not justified in making a fresh wound d cutting down upon the artery in the upper part of its course, less it is absolutely necessary to do so in order to save the tient's life.

In cases of emergency a tourniquet may be extemporized by cing a cork, a stone, or any other suitable substance, folding it lint, and laying it upon the main tery. Upon this pressure may be ide by passing a handkerchief or a ndage round the limb, and tying it a knot. Then, if a piece of stick introduced into the knot and twisted and, a great degree of force may be erted upon the pad. (Fig. 19.)

Fig. 19.



If hæmorrhage follows an operation, d continues in spite of all that can be ne by position, pressure, cold, &c., the rgeon should not hesitate to re-open e wound, and search for the bleeding int. It is better that the patient should ffer a little pain than that he should go on losing blood.

SECONDARY ARTERIAL HÆMORRHAGE,

at is to say, hæmorrhage which comes on after the bleeding has ce been controlled, may occur at various periods, since it depends on different causes.

1. It may come on in a few hours after an accident or opera-

tion. Vessels from which no blood issued at the time the wound was first dressed, on account of the collapse of the patient, may begin to bleed as soon as he gets warm in bed, and recovers from the shock he has sustained. This, as Mr. Spence suggests, should be called "reactionary hæmorrhage."

2. Unhealthy inflammation may take place in the wound within a few days, sloughs may occur, and vessels may be opened up in this way. Or the artery alone may ulcerate or slough. When these accidents happen, styptics or pressure may be tried; but more often a ligature at, or above, the seat of disease will be required.

3. When the ligature separates in the course of ten or fifteen days, bleeding may ensue; the line of ulceration, by which the ligature normally separates, having spread, and opened up the artery. In such a case, it will be needful to enlarge the wound, and tie the vessel again. Sometimes it may be necessary to make a fresh incision and secure the artery in a higher part of its course; and even after this has been done hæmorrhage may again occur in the wound as soon as the collateral circulation has become established.

ARREST OF VENOUS HÆMORRHAGE.

The surgeon should first of all make sure that there is no constriction of the vein above the seat of injury; and then he may apply pressure. Much less force is required to control a vein than an artery. Sometimes, when a large vein presents itself upon an exposed surface, it may be closed by a ligature; but, as a rule, it is neither necessary nor advisable to tie veins.

CAPILLARY HÆMORRHAGE

may generally be arrested without difficulty by exposing the surface to the air, by allowing a stream of cold water to fall upon it from a little height, by pressure, or by styptics.

But occasionally we meet with persons who present what is called the *hæmorrhagic diathesis*, and in such even a capillary hæmorrhage may be followed by fatal consequences. They are generally young—more often males than females—of a delicate or unhealthy constitution, which shows itself by swellings about the joints. The slightest pressure causes a bruise, a trifling cut bleeds alarmingly, while any operation, however small, is attended by the greatest danger to life.

Treatment.—When a child exhibits this tendency, everything should be done to secure him against blows, abrasions, and wounds of all kinds. At the same time the general health should be improved by a bracing and invigorating plan of treatment. The cold bath, sea air, moderate exercise, a nutritious diet, combined with cod-liver oil, the preparations of iron, or the mineral acids—these are the best remedies that we can recommend.

If, after all precautions, bleeding takes place, as it often does, from the nose, gums, or elsewhere, small but frequent doses of the oil of turpentine should be given; while pressure—with or without the tincture of steel or of matico—or ice is tried in the ordinary way. The cautery, whether actual or potential, should be avoided, as being likely, when the slough separates, to increase the mischief.

BRUISES.

A bruise or contusion is an injury caused by a fall, a wrench, or a blow from a blunt instrument, without rupture of the skin. The degree of such injury may vary widely—from the slightest discoloration to complete disorganization. The severest bruises are those which are produced by spent cannon balls.

When a bruise is inflicted the subcutaneous tissues are always more or less lacerated. Blood is poured out. There is *ecchymosis*. The discoloration is at first bluish-black; then it passes through shades of violet, green, and yellow, until by the end of ten days or a fortnight it has disappeared altogether. Even in slight cases the surface is tender, and there are pain and stiffness in moving the part.

The injury is generally confined to the subcutaneous areolar tissue and its capillaries. But sometimes an artery of considerable size is torn across, and blood extravasated in large quantity. Occasionally the whole of the soft tissues are involved to a greater or less depth.

Treatment.—When the injury is of moderate extent, all that we have to do is to guard against inflammatory symptoms, and to promote absorption. With this view the part should be kept at rest, and assiduously bathed with an evaporating or discutient lotion. (F. 15, 18.) A poultice mixed with black bryony root or the hydrochlorate of ammonia is highly recommended by some. (F. 82.) It is astonishing how large a quantity of effused blood will sometimes be absorbed. When an artery has been torn across and is bleeding, we must endeavour to stop the hæmorrhage by position, by cold, by pressure (possibly acupressure), or by the application of a tourniquet. If the bleeding continues in spite of all that can be done by these means, the case must be treated as one of diffuse aneurism. But it is only under urgent circumstances that the surgeon is justified in laying open a fresh ecchymosis. If inflammatory symptoms arise they must be treated in the ordinary way by poultices, fomentations, leeches, and an antiphlogistic regimen.

For the treatment of those cases in which the whole of the tissues are disorganized, we must refer our readers to the section on Gunshot Wounds.

It should be borne in mind that ecchymosis may be produced by other causes besides those we have enumerated—*e.g.*, by the application of a cupping-glass, by scurvy, by purpura, and by low fever.

WOUNDS

are divided into *Incised*, *Contused*, *Lacerated*, *Punctured*, and *Poisoned*.

Incised wounds are inflicted by a sharp cutting instrument. They present clean-cut surfaces, which are favourable for immediate union, or union by primary adhesion. The chief danger that we have to dread from an uncomplicated incised wound is bleeding. The various methods of arresting hæmorrhage we have already explained. When the flow of blood has ceased, the surgeon should see that the wound is free from all extraneous matter, and then the edges should be brought together in such a way as shall best promote a speedy and perfect union. Sometimes, when the wound is slight, the surfaces may be brought together at once. In other and more severe cases it is well to wait till all oozing has stopped, for the effused blood is apt to coagulate and act as a foreign body.

What means are we to use for securing coaptation? This is a very important question, for much depends upon bringing the surfaces accurately together, and keeping them in this position. We are often able to effect these objects by very simple means—by studying the position of the patient, by applying a suitable bandage, by using small strips of plaster, or even by covering the line of incision with a film of collodion, or of "colloid styptic."

In the case of deep incised wounds, such as may be inflicted on the thigh, we sometimes require a bandage which shall draw the edges together, and keep them in that position. A uniting bandage, as it is called, may be made by taking a piece of calico of suitable width, and long enough to go fully twice round the part. Near one end of the bandage two or three parallel slits should be cut, and the other end should be torn into an equal number of tails. When the bandage has to be applied it should be folded round the limb, and the tails passed through the corresponding slits and pinned. As the ends are drawn across the wound a certain degree of compression is exercised upon it, and the edges are brought together. The effect of the bandage may be enhanced by laying pads of lint along the edges of the wound, disposed in such a way as to make a gentle lateral pressure upon the deeper parts.

Smaller wounds may conveniently be brought together with adhesive plaster. This may be done in various ways. Thus an oblong opening may be cut near one end of a suitable strip of diachylon, while another piece is shaped in the manner represented in Fig. 20, by nicking the edges and folding down the plaster so as to form a tongue which may be passed through the corresponding opening, and drawn tight across the wound—in fact it is not unlike the uniting bandage that we have just described. Or the surgeon may take two pieces of plaster shaped something like the letter L, and place one on each side of the wound, in the way represented in Fig. 21, so that when they are drawn together *a* may come to *c* and *b* to *d*.

Fig. 20.

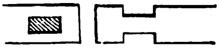
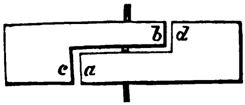


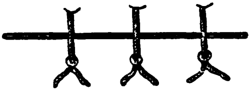
Fig. 21.



If more than this is necessary, we must have recourse to stitches—*sutures*. Sutures are made of various materials, and are applied in many different ways, according to circumstances. Some surgeons prefer hempen thread or silk; others an animal membrane, such as catgut; others, again, a fine wire. The advantages claimed for the latter are that it does not irritate the tissues, and that it does not absorb the secretions. The catgut suture, particularly if it has been rendered antiseptic, is much used at the present day. It is soft and pliable; is does not harbour putrefactive secretions, and it liquefies after a short time—the knot coming away without any pain or difficulty. For all ordinary cases, however, a hempen or silken suture, well waxed, is probably as good as any.

The needle, armed with suitable material, should be passed through the whole depth of the true skin, entering and emerging at a short distance from the line of incision. The thread, gut, or wire is then to be drawn through, and knotted or twisted, so as to keep the opposed surfaces in their proper position. When separate sutures are introduced, each half an inch or an inch apart, they are called *interrupted* (Fig. 22). As many such stitches are to be inserted as are necessary to keep the parts in accurate apposition—but no more. Sometimes, when the wound is deep, and we wish to make sure of bringing the lower part of the cut surfaces together, a pad of lint may be laid along each side of the incision, and pressure made downwards and inwards by means of a bandage.

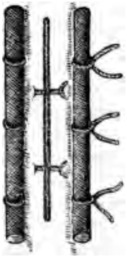
Fig. 22.



The *twisted suture* is a variety of the interrupted. It is made by passing a hare-lip pin through the wound which we wish to unite, and then twisting a silk thread firmly over it in the form of a figure of 8, embracing one end of the pin in each loop of the 8. This kind of suture may be made to lay hold of the tissues to almost any depth. It is particularly applicable to wounds in the face—as, for example, those made in the operation for hare-lip.

The *quilled suture* (Fig. 23) is another variety of the interrupted. It has the same advantage as the preceding—namely, that it brings the deep surfaces of wounds into apposition. But it is applicable to some situations — the perineum, for example — where hare-lip pins would be inconvenient. It is made in this way. A needle, mounted in a handle, is armed with a double thread, and passed deeply across the wound, and then withdrawn, leaving a loop at one side and two ends at the other. This proceeding is repeated as often as the length of the incision may require. A quill, or a piece of a gum catheter, is then inserted through the whole line of loops; the threads are drawn tight; and the ends are firmly tied around a similar piece of gum catheter on the other side of the incision. Lastly, the edges of the wound are united by simple interrupted sutures.

Fig. 23.



The *continuous* or *Glover's* suture is chiefly used for slight wounds of the intestines. Recently, however, it has been employed to close external wounds, in the hope of bringing about more perfect contact, and more speedy union. It is made with a delicate needle and fine thread—the needle passing through and through, while the thread goes over and over, the two edges of the wound, like the seam of a glove.

Sutures are only temporary expedients. With rare exceptions they are removed in the course of from twenty-four hours to a week. If they cause great irritation they must be taken away at once;

must be remembered that they are foreign bodies, and may so much inflammation as to prevent union by adhesion aking place at all.

ıe surgeons object altogether to the use of sutures in wounds scalp, on the ground that they increase the tendency to ɔlas. But practically this is not found to be the case, and ly extra caution which need be observed is not to pass the so deep as to penetrate the aponeurosis of the occipitolis muscle.

lealing with an incised wound we must not forget the conɔnal treatment. We must study to keep the inflammation the limits necessary for union by adhesion. To do this it ometimes be needful to reduce the patient a little by ives, salines, and a spare diet; sometimes to support him lcoholic stimulants and animal food.

he conditions of the wound are not favourable for union by on the edges begin to gape, and a discharge of thin pus its appearance. Suppuration has commenced. The then that the stitches—or a sufficient number of them to free vent—are removed the better, for we must now treat ɔund as a granulating one, and be contented with "union by cond intention." But if, after a time, the inflammation be reduced within the limits that are compatible with the n of healthy and plastic lymph, we may again bring the lating surfaces into apposition, and endeavour to get a lary union by adhesion.

cutaneous wounds may be considered as a variety of the l. A narrow-bladed knife is passed through the skin, and he tissues are divided subcutaneously, the superficial wound exceeding the breadth of the blade of the knife. Tendons catricial bands are often divided in this way; and recently . Adams and Mr. L. S. Little have applied the method to secf bone. The advantage of such incisions consists in this, that is admitted, suppuration does not take place, and the blood is effused is absorbed, as in the case of a simple bruise. ıcision in the skin may easily be closed by a strip of plaster, a pad and bandage.

CONTUSED AND LACERATED WOUNDS

ıe conveniently considered together.

a contused wound the adjacent tissues are bruised or d. In a lacerated wound the edges are torn and ragged. two conditions—bruising and tearing—often go together ctice.

In a lacerated wound there is little to fear from hæmorrhage. Vessels which are torn across soon cease to bleed.

However slight the degree of contusion or laceration may be, it is likely that the vitality of some portion of the tissues will be destroyed. If so, it will be thrown off in the form of a slough; suppuration is established; union by primary adhesion is out of the question. The extent of the slough will depend not only upon the amount of bruising, but also upon the nature of the tissue that is injured. The scalp, the face, the hands, and other parts which are very vascular, are not nearly so apt to slough as parts which are less highly supplied with blood.

Erysipelas, gangrene, and tetanus are the evils that we have chiefly to dread in wounds of this description.

In the *treatment* of contused and lacerated wounds our first care should be to cleanse the part, to replace the tissues, and then to perform any operation that may be necessary. In doing this we should remove as little as possible. A very slender tongue of skin often serves to maintain vitality in apparently hopeless cases.

We should endeavour to promote the separation of sloughs, and to moderate the suppuration, so that there may be as little loss of substance as possible. With this view water dressing or a poultice should be applied, and subsequently a carbolic acid or other antiseptic lotion (F. 9, 11). Perhaps some of the other means which we have before mentioned in speaking of inflammation may be required. At the same time it will almost always be necessary to support the general health.

The *question of amputation* in connexion with this class of injuries is often an extremely difficult one. It would be impossible for me to discuss it fully here. All I can do is to mention the principal points which must influence the surgeon in forming his opinion.

If part of a limb has been severed, or all but severed, from the body, an operation should be undertaken with the view of making a useful stump.

When the whole substance of the limb has been crushed, there can be no doubt that an amputation should be performed.

When the limb has been much lacerated, the bone comminuted, or the main arteries torn across, amputation will generally be the wisest course.

When one of the large joints has been freely opened amputation may be requisite. If, however, the case at all permits of it an effort may be made to save the limb, either by performing a resection, or by treating the wound with ice-bags or antiseptic lotions, combined with absolute rest.

PUNCTURED WOUNDS

are such as are made by a narrow sharp-pointed instrument—*e.g.*, an arrow, a dagger, or the point of a knife. They may penetrate to any depth, and are often accompanied by some degree of laceration. They are dangerous; because of the injury they may do to subjacent organs or parts, and because they may be followed by inflammation in the deeper portions of the wound.

Formerly it was the custom at once to dilate all punctured wounds, and to convert them into incised wounds. But this is not done now except under special circumstances—*e.g.*, when a large artery has been injured and must be tied, or a piece of the weapon remains behind and cannot otherwise be extracted. In all ordinary cases we endeavour by the pressure of pads and a bandage to bring the lower parts of the wound into apposition, so as to get it to unite from the bottom by adhesive inflammation. If this fails, it may be necessary to enlarge the opening, so as to give a free vent to the pus; while poultices are applied to promote the separation of the tissues whose vitality has been destroyed. Subsequently antiseptic or stimulating lotions may be used.

The most frequent, if not the most severe, punctured wounds which are met with in civil practice in this country are those which are made by the entrance of a needle. The readiness with which needles introduced under the skin bury themselves in the tissues, or even travel to distant parts, is extraordinary. The surgeon should therefore be on his guard, and not undertake an operation unless he can feel the needle, or is satisfied of its lying in a particular spot. If he has sufficient proof of its presence, he should make a tolerably free incision over it, and remove it with a fine forceps. If he cannot assure himself of its position, the best plan is to order a poultice, and to keep the part at rest. By this means the superficial tissues will be softened, the needle will make its way in the direction of least resistance—*i.e.*, towards the surface—and then it can be easily removed.

GUNSHOT WOUNDS

include all those which are caused directly or indirectly by the discharge of firearms, by powder, wadding, shot, shell, fragments of stone, splinters of wood, &c.

Such injuries are always more or less contused or lacerated. The bleeding is generally slight; unless one of the main arteries is divided, or a vascular organ, such as the lung, has been penetrated, there is not much danger from hæmorrhage.

Gunshot wounds vary from the slightest contusion to the most frightful laceration. They may produce but little uneasiness, or they may cause instant death.

When the wound is inflicted by a round ball, discharged from a smooth-bore weapon, the aperture of entry is smaller and more sharply defined than the aperture of exit. Such is the general rule. When, however, the firearm is discharged at a very short distance the case is reversed, and the aperture of entry is larger and more irregular than the aperture of exit.

The wounds made by conical balls fired from rifled weapons vary extremely in their characters—from a simple incision to a ragged and lacerated wound. They are, as a rule, much more dangerous than the injuries inflicted by round shot.

Gunshot injuries are generally accompanied by shock, both physical and mental; the measure of which depends chiefly upon the severity of the wound. It is the greatest when the superficial wound is large, when much blood is lost, or when some internal organ of vital importance is affected. In these cases it approaches to syncope; at the same time the mental depression is so great as to fill the most stout-hearted with alarm and despair.

It used to be held that a mere " wind-contusion " was capable of producing a fatal result. But it seems certain that such is not the case, and that in all the recorded instances there must have been actual contact, though the skin may not have been broken.

Round bullets are very easily diverted from their course. A button, a bone, even the thyroid cartilage, has been sufficient to change their direction. Sometimes they have made a circuit round the trunk, and presented themselves at their aperture of entry. Sometimes they have gone half round the cranium, so that their aperture of exit was exactly opposite their aperture of entry—making it appear as if they had passed through the head. At other times they have followed the most devious courses, guided from point to point by the obstacles that came in their way. The history of military surgery is full of such strange and hair-breadth escapes.

At a very short distance powder alone will produce a ragged and scorched wound. Wadding will penetrate at a somewhat greater range. At a short distance small shot enter in a compound mass, making a wound like a bullet. At a greater distance they separate, and only *pepper* the surface. When a round bullet enters it makes a clean-cut track; but it may inflict a severe bruise, and even break a bone without penetrating the skin at all. The following case shows how slight a bruise may give rise to the

erious and even fatal results. A writer in the "Annals of
ry and Naval Surgery" (1864) says: "To show the effects
g hit by a spent ball, or one that has lost its greatest im-
I may mention a case that came under my notice when a
l volunteer was standing talking in a group of his com-
and was struck by a ball in the abdomen, over the region
bladder. The ball fell on the ground at his feet without
injuring his clothes or even marking the skin. He did not
uch pain at the time, and walked to the hospital, a distance
miles, with the ball in his pocket, without feeling much
but he died shortly afterwards from peritonitis and ex-
inflammation of the bladder. The entire surface of the
en presented the appearance of a severe bruise in a few
after being struck."

old round bullet was much more apt to lodge both in the
sues and in the hard than the conical ball of modern warfare.
creased force with which the rifle bullet is projected, as well as
tatory movement which is imparted to it, cause it to inflict
ost severe and dangerous wounds. Nothing is capable of
ing its progress: it splinters bones, and tears its way through
sh.

gular pieces of iron, such as the fragments of shells, make
hastly and dangerous wounds.

smooth round bullet, after it has lodged, may become
ed, and remain in its fibrous envelope for the rest of the
t's life without giving rise to much inconvenience.

egular missiles of all sorts set up so much irritation that
ause their own ejection by suppuration.

tions of dress, accoutrements, &c., are apt to be driven
he wound by the bullet. Sometimes it has been known
ry a pouch of the clothing before it; so that when the
ng was removed, the bullet was withdrawn along with it.

a gunshot wound bones may be simply broken, or the
re may be compound, or comminuted. Again, a bone
be perforated, or the bullet may be arrested and lodge

en a bone is simply bruised without being broken, the
may be more serious than it appears at first sight, giving
prolonged inflammation and necrosis.

s impossible to estimate the extent of a gunshot wound until
ughs have separated; and even then there may be accidents
may arise to complicate the case—hæmorrhage, abscess,
ene, erysipelas, pyæmia, tetanus, non-union of fracture,
crosis. These are some of the conditions which may super-
and which render the prognosis very uncertain.

Treatment.—Gunshot wounds are to be treated on the same general principles as other contused and lacerated wounds. The surgeon's aim should be to arrest hæmorrhage, to remove foreign bodies, to replace the tissues, to hasten the separation of sloughs, and to put the parts in the most favourable position for union by granulation.

The wound should not be enlarged, unless it be to tie a bleeding vessel, remove a foreign body, evacuate matter, or for some other like object. If there is reason to think that a foreign body is present in the wound, a careful examination should at once be made with the finger or with a probe; and if any extraneous substance is detected, it should be extracted with the bullet-forceps or other suitable instrument. The patient's position should be carefully studied. At first, cold water should be applied to the wound. Afterwards, poultices will probably be required. When the sloughs have separated disinfectant or stimulating lotions should be used, as the case may demand, and the part should be supported by a bandage. Constitutionally our first object is to rally the patient from the shock that he has received at the time of the injury. This we do by stimulants and restoratives. There are, however, cases in which they must be given with great caution, and where the state of collapse is even a benefit; in penetrating wounds of the lung, for example. Our next endeavour is to allay the fever which accompanies the process of suppuration. Lastly, we have to support the strength during repair, to guard against any of the complications which have been mentioned, and to deal with them promptly if they arise.

Gunshot wounds of the chest.—A bullet may penetrate the chest, and lodge in the cavity of the pleura. It may there become encysted, and give rise to no further symptoms. More commonly it enters the substance of the lung—sometimes lodging there, sometimes passing quite through.

When the lung has been wounded there is generally great collapse, approaching to syncope; the face is pale and anxious; the breathing difficult. Often there is expectoration of frothy blood, and sometimes the edges of the wound are emphysematous.

When the ball lodges in the lung the prognosis is very unfavourable.

Treatment.—The wound should be examined as gently as possible. Any foreign body that can be felt should be removed. When there is no counter-opening the bullet may sometimes be found lying beneath the scapula. The patient should be laid in bed, and the wound lightly covered with water-dressing, but no immediate effort should be made to counteract the state of collapse.

If it seems probable that internal hæmorrhage is going on it has been recommended to bleed the patient to syncope, in the hope of promoting the formation of a clot. But this plan of treatment is open to question. If outward hæmorrhage is going on there will be no necessity for venesection. The external application of cold, or the internal administration of styptics (F. 41) will assist in arresting the flow of blood. The patient should be kept perfectly at rest, on a low diet, consisting chiefly of cold milk and iced drinks, and everything should be done which can promote the healing of the bullet track. With this view feverish symptoms must be allayed, pain mitigated, and sleep procured (F. 5, 37). But after all that the surgeon can do, it is only too probable that abscess, or empyæma, or pneumonia, will bring the case to a fatal issue.

Gunshot wounds of the abdomen are very fatal in their results. As we have seen, even a slight contusion, which appears at the time insignificant, may give rise to diffuse peritonitis and death.

Flesh wounds of this region are still more dangerous. They should be handled with great gentleness for fear of opening the peritoneal cavity; lightly dressed, and treated on general principles.

In the case of *penetrating wounds*, if the viscera escape injury, as they sometimes do, still there is the risk of peritonitis. But it much more frequently happens that the viscera are implicated, and then the danger is greatly increased. A wound of the solid viscera—*e.g.*, the liver, spleen, or kidney—is more hazardous than a wound of one of the hollow viscera. Again, a wound of the stomach or large intestine is more dangerous than a wound of the small intestines.

The chief symptoms are great collapse—which often terminates fatally—pain, vomiting, and perhaps melæna. These symptoms declare themselves at once. Subsequently there may be peritonitis, or a disturbance of the special function of the wounded viscus. It seldom happens that the intestines protrude through the wound unless it is of large extent.

Treatment.—The wound should be carefully but gently examined. No immediate effort should be made to arouse the patient from the state of collapse, unless, indeed, it threatens to prove fatal. If the bowel is wounded to a small extent only, it is better not to attempt to sew it up. The protrusion of the mucous membrane will probably close it sufficiently until a covering of lymph has been formed. If the rent is larger it should be closed with a continuous suture of fine silk or carbolized catgut, and the bowel returned; or it may be stitched to the edges of the wound and treated as a fæcal fistula. The exact size and situation of the rent must determine which of these two courses is to be adopted.

The patient should be kept perfectly at rest, on very low diet, supplemented by nutritious enemata, and opium in full and repeated doses should be given.

Question of amputation in gunshot injuries of the limbs.—Under this head it is impossible for us to do more than lay down a few general rules. Each case has its own peculiar circumstances, which must receive special consideration. Moreover, it will make great difference whether the injury occurs in civil or military practice. Many a limb has been saved in a regular hospital which must have been sacrificed in campaigning. As a general rule "conservative surgery" is not practicable in warfare.

Amputation should be performed under the following circumstances:—

1. When part of a limb has been severed from the body, or hangs only by the integuments.

2. When the whole substance of the limb has been crushed and bruised to disorganization, with or without laceration of the skin.

3. When a large mass of the soft tissues has been carried away, involving important vessels and nerves.

4. When one of the larger joints is opened, or the bones which enter into its formation are splintered.

5. When there is a severe compound fracture. In a case of compound fracture of the lower end of the femur an amputation may be performed. But when the injury is seated at the upper end of the bone the operation is so uniformly fatal that it is perhaps wiser not to undertake it.

When one of the smaller joints is injured the question of excision should be entertained; but this class of operations is attended with great difficulties in military practice.

Every amputation should be performed as far from the trunk as circumstances will permit, for the higher we rise on the limb the greater is the mortality.

Supposing the surgeon has determined to amputate, another question arises. *When* should the operation be performed? Should it be a *primary* amputation—*i.e.*, an amputation performed within forty-eight hours before febrile symptoms have arisen, or should it be a *secondary* amputation, performed after the traumatic fever has subsided? Experience has decided this question in favour of the former; for it appears that primary amputations are not nearly so fatal as secondary.

ive any form; they may be incised, lacerated, or punctured. essential character is that through them a poisonous al is introduced into the blood, which may affect the whole , and even produce death.

virus may be either a healthy secretion, like the poison of ts, or a morbid product, like the poison of hydrophobia.

unds poisoned by healthy secretions.—It is seldom, in this y at any rate, that the stings of insects lead to serious . When such a case is brought before a surgeon, the wound to be carefully examined with a lens, and if the sting can ind, it should be extracted. The part should then be ntly bathed with an alkaline or evaporating lotion. If it tongue or the fauces that are stung, active measures may uired. It may be necessary to scarify the part, or to apply s beneath the tongue, or even to perform tracheotomy in to prevent suffocation. But the symptoms must be very ; indeed to warrant the surgeon in undertaking this opera-ecause the inflammation excited by such an injury, though r run high, is generally of short duration.

bite of a snake is a formidable thing in the Tropics, but in England. The common viper is the only poisonous that we have in this country, and his venom has but little upon healthy and vigorous persons. It is only in the case very old or the very young, or when the bite has been ed on a critical part—such as the interior of the mouth— ctive local measures need be used. In most instances all wanted is a restorative to support the patient under the which he is apt to feel.

warmer climates several very formidable snakes are met -*e.g.*, the rattlesnake in America, the puff-adder in Africa, e Cobra-di-capello in India. When a bite has been in-by one of these the treatment must be prompt and active. ture should be immediately thrown round the limb above at of injury, to obstruct the return of blood to the heart. ound should then be thoroughly cleansed by sucking, or by pplication of a cupping-glass; or its surfaces should be yed by nitric acid, nitrate of silver, or the actual cautery. s favourably situated the bite may be excised. At the same hat these local measures are adopted stimulants should be given to support the patient and to prevent the collapse is so apt to follow from alarm and the depressing action venom. Professor Halford of Melbourne has recommended the injection of ammonia into the veins. The practice has been attended by success in his hands, and is worthy of a further trial (*Brit. Med. Jour.*, Jan. 30th, 1869).

Wounds poisoned by morbid products.—Hydrophobia is caused by the bite of the dog, wolf, fox, and some other animals, when in a state of rabies. Such rabies seems to occur under two forms. Sometimes the animal shows unusual activity, sometimes unusual depression. In either case the bite is capable of producing hydrophobia. But it is worthy of notice that of those who are bitten only a small proportion manifest the disease—about one in twelve or fifteen. The virus requires a period of incubation, and seldom shows its effects for a month or longer. The most dangerous bites are those on the hands, face, and other exposed parts.

The premonitory symptoms of hydrophobia are these:—the wound becomes irritable, painful, and discoloured. Though it may have healed, it sometimes opens again, and begins to discharge an unhealthy matter. The patient becomes uneasy, restless and feverish; fits of excitement alternating with periods of depression.

In the course of three or four days the actual symptoms commence, and no doubt remains as to the fearful nature of the malady. There is inability to swallow fluids in consequence of spasm in the pharynx. The muscles of respiration as well as those of deglutition are thrown into painful and violent contractions by the slightest exciting causes, and there is loud and distressing hiccup. The patient is usually horror-struck. Nothing can exceed his alarm and despair. He is quite unable to sleep. His eyes are wild and bloodshot; his breathing difficult; his mouth loaded with viscid saliva, which froths upon his lips, and which he is constantly trying to expectorate. He may die asphyxiated in one of the attacks of dyspnœa, or he may sink at the end of a few days from exhaustion.

Of the pathology of hydrophobia we know nothing. The conditions which induce rabies in animals, and the changes, local and constitutional, which take place in the patient are alike involved in mystery. The principal morbid appearance that has been met with after death has been congestion of the brain, spinal cord, and their membranes, with serous effusion.

Treatment.—When there is the slightest suspicion of danger the bite should be freely excised and bleeding promoted. In situations where the knife cannot be used the surfaces of the wound should be thoroughly touched with a pencil of lunar caustic, or with a glass rod dipped in the strong nitric acid.

We have no specific for hydrophobia; when it is once established all that can be done is to support the patient by careful feeding, and to palliate the symptoms by powerful sedatives and narcotics. Our best hope of mitigating the severity of the disease lies in the use of opium, Indian hemp, chloroform, ice to the spine, or the subcutaneous injection of morphia. (F. 7.) At the same time everything should be done which can soothe the patient and allay his irritability. All causes of excitement, mental as well as bodily, should be carefully removed. But it is seldom that we succeed in averting the fatal issue.

EQUINIA.

The poison of equinia is generated in animals of the horse tribe. It may be transmitted to man either by inoculation, through a sore, or by mere contact with the skin or mucosa without abrasion of surface. It manifests itself under two forms—*glanders* and *farcy*. In both there is feverishness with glandular enlargements, and the formation of pustules on the skin, particularly about the face and in the neighbourhood of the joints.

The most characteristic symptom of glanders is an inflammation of the lining membrane of the nose. An offensive discharge mixed with blood pours from the nostrils. Sometimes this inflammation runs so high as to cause sloughing. At the same time the salivary glands as well as the cervical lymphatic glands become swollen, tender, and prone to suppuration.

In farcy the subcutaneous glands throughout the body become hard and painful, constituting what are known as "farcy-buds."

The glandular enlargements as well as the pustules in equinia are probably due to the deposition of a material analogous to tubercle. The affection of the Schneiderian membrane is no doubt of the same kind. This is borne out by the fact that, if the patient lives long enough, there is always some consolidation of the lungs with circumscribed patches of pneumonia.

Each variety of the disease may run an acute or a chronic course. When acute it is almost certainly fatal. When chronic there is a hope of recovery.

The *treatment* of equinia must consist in supporting the patient by a well regulated diet, favourable hygienic conditions and tonic medicines, while the pustules and sloughs are treated on general principles. For the offensive discharge from the nose the nasal cavities should be frequently syringed with astringent or disinfectant lotions.

DISSECTION WOUNDS

are generally free from danger; sometimes, however, they give rise to the most serious and even fatal consequences. Everything seems to depend upon the health of the person who is wounded, and the nature of the matter which is inoculated.

An individual whose health is impaired from over study, dissipation, or any other cause, is much more likely to suffer than one who is robust and in good condition.

If the matter is inoculated from a body but recently dead, it is much more dangerous than if it is taken from one in an advanced stage of decomposition. For this reason wounds received in the deadhouse are more to be feared than those which are met with in the dissecting-room.

The matter derived from different dead bodies seems to vary much in its poisonous qualities. *Cæteris paribus*, that which is drawn from the bodies of those who have died of erysipelas, pyæmia, peritonitis, and puerperal fever appears to be much the most dangerous.

In a severe case the symptoms are local irritation, heat, swelling, and throbbing pain. Sometimes a pustule forms at the seat of injury. Soon the absorbents inflame. The lymphatic glands become enlarged and tender, suppuration takes place, diffuse cellular inflammation follows, and abscesses form in various parts.

These symptoms are accompanied by a high degree of fever of the asthenic type, and the patient either sinks at the end of a few days or weeks from exhaustion of the vital powers; or, if he recovers, it is only after a tardy and prolonged convalescence.

Treatment.—The first thing to be done is to bind a ligature tightly round the part above the seat of injury. The wound should then be washed with a stream of cold water, and afterwards sucked, so as, if possible, to get rid of the matter altogether. If it seems desirable to do more than this, the wound may be touched with strong nitric or pure carbolic acid. If, however, notwithstanding these precautions, it should inflame, poultices must be applied at once. As soon as the lymphatic glands become painful they should be assiduously fomented; and if suppuration takes place, incisions should be made without delay. If abscesses form in remote parts they should be opened immediately.

The constitutional treatment consists in clearing the intestinal canal by a purgative, allaying the febrile symptoms by salines, and procuring sleep by opium, while the strength is upheld by stimulants and a nutritious diet.

MALIGNANT PUSTULE

(*Charbon*) is caused by a poison which is generated in horned cattle. Of the "bovine disease" which gives rise to the virus very little is known. The poison, however, may be transmitted to man either by inoculation or by contagion. Whether it can be introduced by inhalation or by eating the diseased meat is uncertain. In my work on the Diseases of the Tongue, I have alluded to some remarkable cases of malignant pustule affecting that organ.

Symptoms.—A dark pustule forms on the affected part, bursts, and discharges an offensive slough. The resulting ulcer spreads rapidly by phagedænic action. This local inflammation is accompanied by fever of a putrid and typhoid character.

The *treatment* consists in arresting the unhealthy ulceration by caustics, favouring the elimination of the poison from the system, and upholding the patient's strength.

WOUNDS BY IRRITANT POISONS.

The irritant poisons, externally applied, give rise to injuries which fall under the care of the surgeon.

The *mineral acids* rapidly destroy the tissues with which they come in contact, and cause extensive wounds.

The injured part should be well washed—first with warm water, and then with a solution of carbonate of soda; after this has been thoroughly done a poultice or a fomentation should be applied.

When the poisonous agent is one of the *caustic alkalies* the part should be freely bathed with a weak acid solution—*e.g.*, vinegar and water—and then poulticed.

The only *metallic substance* which we need mention is the nitrate of silver. It is readily decomposed by a solution of common salt.

EFFECTS OF HEAT.

Heat, communicated from solid bodies, gives rise to *Burns;* from fluid or gaseous bodies it occasions *Scalds.*

Injuries caused by the application of heat are attended by various dangers.

(*a*) They are accompanied by a shock, which sometimes approaches to syncope, and may even prove fatal.
(*b*) The period of depression is followed by proportionate reaction, with inflammatory symptoms.
(*c*) During this second stage internal organs are apt to become affected, particularly the lungs and the small intestines.
(*d*) If the patient survive these dangers, he has still to go through the exhausting processes of suppuration and repair.

Injuries caused by heat are divided by Dupuytren into six degrees. His classification—which is one of great practical value—is now generally adopted:—

1. Where the cuticle is merely scorched.
2. Where the cuticle is raised in blisters.
3. Where the *cutis vera* is more or less destroyed.
4. Where the injury extends through the cuticle and true skin, and reaches the subcutaneous cellular tissue.
5. Where the muscles and fasciæ are involved.
6. Where the whole thickness of the limb is implicated.

In practice we generally find that several of these degrees go together. A case in which the muscles are touched will probably show the milder forms of injury as well.

Mr. Curling has drawn attention to an interesting point connected with extensive burns. He has observed that they often seem to occasion ulcers in the duodenum; and he supposes that Brunner's glands, in order to compensate the functions of the skin, take on an increased and even excessive action. This point well deserves further inquiry, and it should make the surgeon attentive to the slightest indications of gastric or intestinal irritation, as shown by vomiting or purging.

The *prognosis* in burns or scalds will depend in a great measure upon the amount of surface that is involved; both because the skin is a tissue which is highly supplied with nerves, and also because, when its functions are arrested to any considerable extent, internal organs are very apt to become congested and inflamed. But the age of the patient, the situation of the injury, and the depth to which the destructive action has penetrated, are points which must not be overlooked in forming an opinion on the case and its probable issue.

The old, the young, and those in impaired health are particularly liable to suffer from the shock of a severe burn or scald.

The situation of the injury is very important. If it is on the head it may give rise to inflammation of the brain or its membranes. If it is on the chest, pneumonia or bronchitis is likely to ensue. If a child has scalded the back of its mouth by attempting to drink out of the kettle, the injury may cause speedy death by inflammatory closure of the *rima glottidis*.

The *treatment* of burns and scalds is partly constitutional and partly local.

Constitutional treatment.—The first thing to be done is to rally the patient from the state of shock, and to bring about reaction. With this view the patient should be placed in bed with a hot-water bottle to his feet, and stimulants should be given at once—a glass of warm brandy and water or a cup of hot tea, for example. If the depression is accompanied by much anxiety or alarm, sedatives, such as the tincture of hyoscyamus, or the vinum opii, may be combined with the restoratives. Death not unfrequently takes place during this first period of the case.

When reaction has begun, our aim must be to keep it within moderate limits—to restrain the inflammatory action. To this end perfect quietness and repose should be enforced, and mild purgatives or salines should be given from time to time as occasion requires. The strength must be upheld by stimulants and by a nutritious diet. Pain must be mitigated and sleep procured by the cautious use of sedatives and narcotics.

This is the most fatal stage in the course of a severe burn, and the surgeon ought to be on the watch for the earliest signs of complications—meningitis, bronchitis, pneumonia, albuminuria, or intestinal ulcers.

When the inflammatory symptoms have subsided the patient will still have to pass through a period of suppuration. If the injury has been of considerable extent, his strength will, even under the most favourable circumstances, be severely taxed; but if hectic should supervene, it will go hard with his life. To uphold the vital powers, by cordials, tonics, and good food, is the great aim of constitutional treatment while suppuration continues.

Local treatment.—The patient's clothes should be gently and carefully removed, being cut wherever they are adherent to the body. If blisters have formed they should be pricked and the serum let out, but the cuticle should on no account be detached.

In all injuries from burns or scalds it has been found that the sufferer experiences great relief when the surface is coated with an unirritating substance which excludes the air, and maintains an equable temperature. This principle may be carried out in a variety of ways. Some surgeons dust flour, or starch, or gum tragacanth over the affected surface. Others prefer to varnish the part with a mixture of collodion and castor-oil, two measures of the former to one of the latter (F. 62, 63). Others employ a weak turpentine lotion or ointment. "Carron-oil" (equal parts of lime-water and linseed-oil) enjoys a widespread reputation. But whatever application is used, a smooth and thick layer of cotton-wool should be laid over it, and retained by a bandage; for it is not merely an equable temperature, but a *high* one as well, that seems to allay the scorching pain. When once the dressing has been applied it should be changed as seldom as possible—indeed, only where the discharges render such change absolutely necessary. In this way the repair goes on most favourably, and the patient is saved from much pain and distress.

If the burn is of the fourth degree, or more, this treatment should be followed for a few days, and then poultices should be applied. When the sloughs have separated, the wound should be treated on general principles with water-dressing, or stimulating or astringent lotions, as the case may require. An ointment of chalk, or a weak solution of carbolic acid (F. 9) forms excellent dressings when the suppuration is very profuse.

When cicatrization commences the surgeon must bear in mind the great tendency there is to contraction, and do all in his power—by studying the position of the patient, by bandages, by mechanical appliances—to prevent it. But notwithstanding all his efforts, more or less contraction is sure to take place. Sometimes this gives rise to the most frightful disfigurement and distortion. Can anything be done to prevent or to remedy these evils? The character of the cicatrix may perhaps be improved by making skin-grafts. But if, notwithstanding, an unsightly or inconvenient cicatrix is left, nothing short of an operation has any permanent value. In planning such operations the surgeon has great scope for his ingenuity. Sometimes the cicatrix may be divided subcutaneously, and stretched by mechanical means. Sometimes a flap of skin may be partially dissected from the adjacent parts and turned across a corresponding surface which has been laid bare on the cicatrix. Or a portion of skin may be similarly dissected from a distant part, the cicatrix being brought to it, and firmly bound in that position till union has taken place—constituting a true Tagliacotian operation. Sometimes the best we can do is an amputation.

EFFECTS OF COLD.

When severe cold is applied to the body it depresses the action of the heart, and paralyses the nervous force. These effects are most visible in parts where the circulation is naturally feeble, as the nose, ears, feet, &c. The arterial supply is diminished, while the blood is retarded in its passage through the veins. Hence the part loses its natural colour, and becomes purple or blue. Sensation is almost gone, vitality is reduced to a very low ebb—in fact there is *frost-bite*. Still, however, the circulation may be restored by judicious measures.

But if the degree of cold is very intense, or if exposure to it is long continued, vitality is wholly destroyed, mortification takes place, and restoration is impossible. This untoward result is particularly apt to occur in those whose vigour is already impaired by want of sufficient food and clothing.

It should be noted that one effect of extreme cold is to produce an overpowering sense of drowsiness, but to yield to the inclination and to lie down to sleep under such circumstances, is almost certain death.

Treatment.—When a part is frost-bitten our object should be to bring about *very gradual* reaction. The patient should be placed in a room without a fire, and the part must be gently but continuously rubbed with snow or other cold applications. Heat should on no account be applied, as it is very apt to produce gangrene. The temperature must be restored from within, not from without. The object is to make the circulation advance from the deeper parts to the more superficial. Stimulants—a little warm coffee or brandy and water, for example—may be given from time to time in small quantities.

When reaction has taken place, and the circulation has been restored, it may be evident that some portion of the tissues has mortified. If this is the case poultices should be used to hasten the separation of the sloughs, and the wound which remains should be treated on general principles.

Chilblains arise from a mild degree of frost-bite, and when circulation is restored an almost intolerable itching and tingling is experienced, and the part is red and swollen. They are frequently induced by wearing boots that are too thin for the season, and then sitting before the fire with damp or wet feet. When the inflammation thus set up runs on to ulceration it produces what is called *a broken chilblain.*

Chilblains are most often seen in children, but they may occur also in adults who have a languid circulation, or who are in weak health.

Treatment.—When persons are subject to chilblains they should be careful to change their stockings after exercise, as the dampness caused by confined perspiration is very apt to induce them. When inflammation has commenced the affected part should be painted with tincture of iodine, or with a mixture of camphor and zinc in glycerine, or bathed with a lotion of Goulard water and laudanum; or rubbed with compound camphor, iodine, or turpentine liniment; or with iodine or calamine ointment. If the chilblain breaks, it must be treated on general principles, first with poultices or water-dressing, and afterwards with stimulating applications. In any case it will be necessary to give proper attention to the patient's food and clothing, and also to prescribe tonics, more particularly the preparations of iron.

SUSPENDED ANIMATION.

The suspension of animation may commence either at the heart or at the lungs. It may be due either to *syncope* or to *apnœa*.

Syncope (*fainting*) depends upon an irregular and deficient supply of blood to the brain. It may arise from hæmorrhage, debility, emotion, impure air, or other causes.

The symptoms are giddiness, swimming in the head, insensibility, and loss of consciousness. The patient lies still and motionless. The lips are white; the surface of the body blanched and cold. The breathing is slow and shallow. The pulse feeble and intermittent. Death may result from the entire stoppage of the heart's action.

The *treatment* consists in laying the patient flat on a bed or on the floor, and even depressing his head slightly by placing a pillow underneath his back. His face and chest should be sprinkled with cold water, strong smelling salts should be held to his nose, and warmth and friction applied to the surface of the body. As soon as he begins to rally, a little stimulant—brandy, or sal volatile, with water—should be given.

Apnœa (or, as it used to be called, *asphyxia*) occurs when the supply of air to the lungs is cut off. This may arise in various ways—by hanging, drowning, immersion in irrespirable gases, &c.

The blood in the lungs is not aërated; dark-coloured blood circulates through the brain, giving rise to coma or convulsions, and after the lapse of three or four minutes the heart's action ceases altogether.

Treatment.—The cause should, if possible, be removed. Any ligature that may be round the patient's neck, any pressure that may be preventing the expansion of the chest, should be taken away.

If respiration is still going on, the surface of the body should be rubbed, hot-water bottles applied to the epigastrium and feet, and ammonia held to the nostrils. When sensibility and consciousness begin to return, a cordial should be given.

If breathing has ceased, but the heart still beats, artificial respiration should be commenced without delay (see Artificial Respiration), while at the same time the stimulating measures mentioned in the foregoing paragraph should also be employed.

If the heart's action has ceased as well as the breathing, galvanism should be used in conjunction with artificial respiration. When the case has gone as far as this, there is but a very small hope of restoring animation.

In cases of hanging, death may take place by dislocation of the cervical vertebræ, or by congestion of the brain and apoplexy, as well as by apnœa from pressure upon the trachea.

In cases of drowing the patient should of course be removed from the water and carried to the nearest shelter. He should be at once placed in a hot bath or wrapped in a warm blanket, with hot-water bottles beside him; the surface of the body rubbed, and smelling salts applied to his nostrils. At the same time artificial respiration should be practised. As the water does not find entrance into the lungs it is not necessary to invert the patient before commencing the artificial respiration, as was formerly done. All that is needed is to remove the mucus from the mouth, and to draw the tongue well forward.

ARTIFICIAL RESPIRATION

may be practised in several ways, but the principle is the same in all. Our aim is, first, to expand the thoracic cavity, and then to contract it in imitation of the natural movements of inspiration and expiration. Whatever plan is adopted the steps of the process should be repeated about fifteen times a minute, steadily and with regularity, and persevered in as long as there remains the slightest hope of restoring animation.

Dr. Marshall Hall's method consists in laying the patient on his face on the floor, or on a table, and then turning him over on his back. By this means the weight of the body compresses the chest while it expands again by the natural elasticity of the ribs.

Dr. Sylvester's method is easier of application, and has now been generally adopted by the Royal Humane Society. The patient should be laid on his back, and then both his arms should be raised above his head, held there for a second or two, and brought down again on the sides of the chest with some degree of pressure. After the lapse of two seconds the process should be repeated. Thus the muscles of respiration attached to the humerus serve to dilate the thorax, while it is compressed by the adduction of the arms. This plan is as efficient as any other; it is simpler, and it has the additional advantage of appearing less rough in practice.

PART III.

CONSTITUTIONAL EFFECTS
OF
SURGICAL DISEASES AND INJURIES.

SHOCK.—COLLAPSE.

WHEN a person receives a severe injury his nervous system sustains a *shock*. This shock manifests itself in a variety of ways, but especially by its effect upon the heart.

The *symptoms* vary widely in degree. To take a typical case:—The patient lies in a helpless, half-conscious state. When addressed, he answers in an incoherent way. He is cold and shivering, the surface of the body being blanched and bedewed with moisture. The pulse is quick, small, and almost imperceptible; the breathing irregular and sighing; the features pinched; the expression anxious; the eyes vacant; the sphincters relaxed. Sometimes convulsions ensue, especially in children. Sometimes there is vomiting, which is rather a good sign, and often indicates the approach of reaction.

These symptoms may be so severe as to produce complete collapse, followed by death from syncope in the course of a few minutes or hours. This fatal result is most likely to happen when the injury is very extensive, when the chest or abdomen is penetrated, or when some internal organ of primary importance is involved.

It is interesting to observe that the shock may be communicated to the nervous system through the mind, as well as through the body; and in every case the mental constitution of the patient will influence the degree of prostration.

Treatment.—When the shock is chiefly mental, a few reassuring words, a cordial, and rest in bed, with an extra blanket, and a hot-water bottle to the feet will suffice to restore the patient.

In the milder examples of shock from injury the same treatment will generally be found enough.

If the case is more severe the patient should be laid in bed with his head rather low. Warm flannels, hot-water bottles and friction should be applied to the surface of the body. Stimulants should be given gradually and with caution. While the collapse continues, bleeding should on no account be practised; nor should any operation be undertaken during this stage. If there is a wound, it should be washed, and treated in the ordinary way.

In extreme cases we must have recourse to stimulating enemata, rubefacients, blisters, sinapisms, or galvanism to restore the natural functions. Stimulants—ammonia to the nostrils, or a few drops of brandy placed within the lips—are often of great value. Of course if the patient is in an insensible state, fluids ought not to be given in any quantity, for fear they pass into the larynx.

As the sufferer recovers from the shock, reaction takes place, and our aim must be to keep it within the limits consistent with health. In mild cases it is easy enough to do this by keeping the patient quiet, restricting his diet, and acting upon the bowels. But all severe cases will be followed by more or less fever.

SURGICAL OR TRAUMATIC FEVER

is the name given to the general febrile state which is apt to follow injuries or operations.

The nature of such fever varies with the degree of injury, the particular part affected, and the constitution and habits of the patient.

If he is robust and vigorous the inflammatory symptoms will be of the sthenic kind. There will be a full and quick pulse, a hot skin, a high temperature, a flushed face, suffused and bloodshot eyes, and great thirst.

If delirium (*traumatic delirium*) comes on, as it often does, especially in those who have been accustomed to take large quantities of alcohol, it is furious in its character. The patient is ungovernable, talks loudly, and is under the influence of delusions. Sometimes he is inclined to be merry, but more often he is angry. He tosses himself in bed, is always wanting to get up, and does not seem to feel any pain from the injury, however severe it may be.

The *treatment* of this form of traumatic fever and delirium must be actively antiphlogistic. Venesection, leeches, and ice to the head, purging, and low diet—these are the only remedies that hold out a hope. Opium is almost useless, and may even do harm.

If it is given at all it should be combined with tartar emetic, as recommended by Dr. Graves. (F. 35.)

If, on the other hand, the patient is broken in health or of a feeble constitution, the symptoms will be of the *asthenic* or *irritative* type—the pulse quick and small, the tongue brown, the skin pale and clammy, the features pinched, and the expression anxious.

If delirium ensues, it is of the low muttering kind; or else it is busy, meddling, and suspicious, like delirium tremens.

Treatment.—The bowels should be relieved, and then opium should be given in full doses, and repeated every three hours, until sleep is induced. It will generally be found advisable to combine the opium with stimulants, and to give it in brandy or in stout, or in whatever the patient has been accustomed to drink. At the same time he should have plenty of plain, nutritious food.

In all cases of traumatic delirium the patient will have to be restrained so as to prevent his getting out of bed. If possible, this should be done by persuasion, management, skilful nursing, and gentle force. If more than this is required it will be necessary to put on a strait-waistcoat. Such a waistcoat is made of strong cotton cloth or of ticking, and extends from the root of the neck to the waist. It has no opening in front, but at the back it is fastened with tapes. The sleeves are long, so as to extend some little distance beyond the hands, and closed at the extremities. A cord is generally tied round them below the hand, and carried down to the foot of the bed, so that the patient is obliged to keep his arms by his sides; or else they are crossed over his chest, and secured in that position. The waistcoat is usually furnished with shoulder-straps, through which a belt may be passed in order to restrain the movements of the patient's body.

We have described extreme cases as types of the two forms of traumatic fever, but in practice they are often found more or less blended.

HECTIC FEVER.

When suppuration is very profuse or long-continued it gives rise to a febrile state, known as *hectic*. It is important to observe that this condition does not declare itself as long as the pus is pent up in a cavity—*e.g.*, in a psoas abscess.

The *symptoms* are in many respects those of asthenic fever, but with some peculiar features. Hectic is marked by periodic remissions and exacerbations. The exacerbations, which are often accompanied by rigors, take place towards night, while the remis-

occur in the morning. After the paroxysm has reached its
, it commonly terminates in profuse sweating, with great
stion. The pulse is quick, soft, and easily excited. The
is covered with white fur in the centre, while the tip and
are unnaturally clean and red. The skin is at one time hot
ry, at another soft and moist. The temperature rises. The
is turbid and offensive. Occasionally there is diarrhœa. The
te is good; sometimes it is excessive. The eyes are brilliant;
heeks flushed. The strength fails, while the emaciation
ses.

mental phenomena are hardly less characteristic than the
. The patient is easily depressed, but more easily excited.
ind is buoyant and hopeful, and, as soon as he is relieved
his present distress, he is sanguine of recovery.

atment.—Hectic is a fever of irritation and debility, and
eatment which it requires is essentially soothing and tonic.
atient should be removed from everything that can excite
and placed in the most favourable hygienic conditions.
this view he should have plenty of fresh air. If possible,
uld be taken to the sea-coast—such a resort being selected
ot too keen and stimulating. His diet should be liberal
merous, and should include a large proportion of animal
If his strength permits, he should take moderate exercise,
of fatigue. If walking is out of the question, he should go
a carriage or Bath-chair. In any case he should be as
in the open air as possible. The secretions should be regu-
while such medicines are given as cod-liver oil, arsenic,
e, and the preparations of iron. The mineral acids are
larly useful, both as tonics and to check the profuse sweat-
The diarrhœa, which is so apt to arise, must be treated by
gents and sedatives. Hot sponging and rapid drying is
mes very refreshing to the patient.

course, every local means, including the various antiseptic
gs, must be used which can limit the suppuration, and bring
a healthy condition of the wound, which is the cause of the

ERYSIPELAS

name given to a constitutional disease of the inflammatory
which is caused by a specific poison, and which commonly
sts itself by certain local symptoms. The constitutional
r is always present; the local phenomena admit of some
on, and may even be altogether absent.

fever which attends erysipelas is of the asthenic kind. The
may safely be regarded as one of debility. There is

shivering and nausea; a quick, weak pulse; a brown tongue; a hot, dry skin; and a tendency to low muttering delirium. At the same time it is no uncommon thing to see the brain, the lungs, or the alimentary canal involved in the inflammatory process. There may be encephalitis, or pneumonia, or bronchitis, or diarrhœa, or vomiting.

When erysipelas shows itself locally it is by an unhealthy inflammation which has a remarkable tendency to spread. The lymph which is poured out is of the aplastic, corpuscular kind, and forms no barrier to the progress of the disease. This extends chiefly by continuity along the same plane of tissue. Its favourite seats are the free surfaces, such as the skin, the mucous membranes, and the inner coats of arteries and veins; but it also affects the deep layers of cellular tissue.

Erysipelas is broadly divided into *idiopathic* and *traumatic*.

Of the essential nature of the poison of erysipelas we know nothing. When the disease arises spontaneously it may be said to depend upon a want of proper attention to the laws of health. Thus there is a predisposition to it when the system is disordered from living too high, or living too low; from intemperance, from insufficient clothing or exercise, from a want of cleanliness and fresh air, or from any other similar cause. The same may be said also of persons who are labouring under any disease which affects the purity of the blood, as albuminuria or diabetes.

The changes of the weather, and the alternation of the seasons have some effect in favouring the development of the disease.

Wounds are the most frequent exciting causes of erysipelas. It behoves the surgeon, therefore, to beware how he undertakes an operation when the disease is epidemic. Those wounds are likely to be attended with the most serious consequences in which the deep planes of cellular tissue are exposed.

The disease may easily be produced, at least in hospitals, by over-crowding, and a want of proper cleanliness and ventilation; and, when once it has been set up, it is highly infectious. It is, therefore, of the greatest importance that a patient affected with erysipelas should be isolated, and that the utmost care should be taken by personal cleanliness on the part of the attendants, and by the free use of disinfectants to prevent it from spreading.

The best classification of erysipelas is into (1) cutaneous; (2) cellulo-cutaneous; and (3) cellular.

1. The cutaneous is the mildest form of the disease. It extends only to the true skin. The surface becomes of a bright rose colour, which disappears on pressure, and usually fades away at the edges into the healthy skin. The part is dry, hot, hard,

and sometimes œdematous, and there is pain of a smarting character.

When it arises spontaneously without a wound it generally attacks the face; but it may show itself anywhere. Sometimes it suddenly leaves one part and appears in another. (*Metastasis.*) This erratic form of the disease always indicates great debility, and is accompanied by considerable risk, inasmuch as it is apt to attack the fauces. Hippocrates long ago observed that when erysipelas fixes upon a particular part of the body it is more formidable in appearance than in reality, and that the disease is attended by most danger when it leaves an external part and is determined inwardly (Syd. Soc. Translation, i. 401).

2. Cellulo-cutaneous (or phlegmonous) erysipelas extends through the skin to the subjacent cellular tissue. When once inflammation has been lighted up in a layer of areolar tissue it runs on rapidly to suppuration and sloughing.

The local phenomena are much the same as in the former case, only they are more intense. The tint of the surface is deeper and more fiery, the skin is harder and more brawny, the swelling is much greater, while the cuticle is raised in unsightly blisters. After about a week, these symptoms undergo a change. Sometimes that change is a favourable one, and resolution takes place. But much more frequently it is an unfavourable one. The part becomes soft and doughy. The surface loses its uniform colour, and becomes mottled. It is then evident that suppuration has occurred, and that sloughing is imminent. When an extensive surface is affected, or when the patient is feeble or out of condition, the danger is great. At the best, recovery will be tedious, and it is highly probable that some impairment of tissue, or of function, will remain for years.

3. The *cellular* variety of erysipelas (*cellulitis*) is the most severe and the most dangerous. The inflammation attacks the planes of cellular tissue, diffuses itself rapidly along them, and leads to the most destructive suppuration and sloughing. Sometimes it is the more superficial layers which are affected, *e.g.*, that which lies immediately beneath the skin; sometimes it is the deeper layers, *e.g.*, those which divide the muscles or envelope the bladder.

In any case the symptoms run high. There is great pain and swelling. The part becomes of a dusky purple colour, hard and tense, and the skin is œdematous. In two or three days these symptoms alter. There are rigors. Suppuration has begun. The parts become boggy from infiltration of pus, and mottled from the approach of gangrene. Sloughing takes place rapidly and extensively, leading in most cases to a fatal issue in the course of a week.

The *constitutional symptoms* which attend these different forms of erysipelas are the same in kind, though they vary in degree.

If the inflammation has a sthenic character at the outset, it rapidly degenerates. The typical erysipelatous fever is of the low asthenic kind. The pulse is quick and weak, the skin dry and pungent, the temperature high, the tongue furred and brown, with a tendency to muttering delirium. Frequently there is diarrhœa. In an uncomplicated case it is death from exhaustion that the surgeon has to guard against.

The access of suppuration will be marked by rigors; and when gangrene commences, there will probably be a sudden depression and prostration of the vital powers.

In all the more severe cases it is, as we have said, most likely that some of the internal organs will be secondarily affected. There will be encephalitis, or bronchitis, or pneumonia, &c.

The prognosis in cases of erysipelas depends chiefly upon the variety that we have to deal with, the seat of the disease, and the constitution and habits of the patient. If he is the subject of chronic disease of any internal organ—more particularly of the kidneys—it will add very much to the danger of the case.

The *treatment of cutaneous erysipelas* is partly constitutional and partly local.

In the *constitutional treatment* the first thing to be done is to clear the *primæ viæ* by an emetic or a purgative, or both. If the inflammatory symptoms run high, a mildly antiphlogistic plan may be followed, by limiting the patient to a fluid diet, and promoting the action of the skin, kidneys, and bowels. It must not be forgotten, however, that though at the outset the inflammation may be sthenic, it will ere long in all probability become asthenic. Soon stimulants and tonics—the preparations of ammonia and iron (F. 30, 31, 41), and a light but generous diet, with a fair allowance of brandy, port wine, or egg-flip (F. 86) —will be required to support the failing strength. In many cases it is necessary to pursue this method from the first.

Local treatment.—In every case the part should have perfect rest; and, if possible, it should be elevated, while fomentations—plain or medicated—are diligently used. Cold applications should be avoided. They are apt to produce metastasis, which is very undesirable. The surface should be dusted with flour or starch, or painted with a mixture of collodion and oil (F. 62), so as to exclude the air and keep up an equable temperature. These are excellent applications, and very grateful to the feelings of the patient. Some surgeons prefer astringent lotions (F. 12, 13, 20). These may be used warm or tepid. In erratic cases blisters are often beneficial, and tend to fix the disease to one spot. When there is much tension, small punctures should be made in the skin with the point of a lancet—the number varying according to the extent of surface affected. In this way a little blood and serum escape, and the pressure is relieved. Sometimes an attempt is made to limit the inflammation by a boundary line of lunar caustic; but the success which has attended this practice is hardly sufficient to justify it.

After the acute symptoms have disappeared, friction or a bandage may be employed in order to restore the healthy condition of the tissues.

Treatment of the cellulo-cutaneous erysipelas.—The constitutional treatment of this variety is much the same as that of the cutaneous erysipelas. But as the disease is more formidable, the patient must be watched more narrowly, and the tonic remedies pushed further if need be.

The local treatment does not differ in its earlier stages from that which has been described above. As soon as the skin becomes tense, limited incisions should be made in it, and when matter has formed it must be let out without delay.

This variety of the disease is apt to be followed by troublesome sequelæ, such as solid œdema, contracted cicatrices, sinuses (connected perhaps with dead bone), &c.

The treatment of cellular erysipelas is only an advance upon that which we have described as suitable to the cellulo-cutaneous variety.

Stimulants will probably have to be given both more freely and at an earlier date. The surgeon should be on the watch for abscesses, and open them as soon as possible.

There are some situations in which erysipelas is particularly apt to occur, and where, from local or other conditions, it deserves special notice.

Cellulo-cutaneous (phlegmonous) erysipelas of the scalp is often seen in persons who are enfeebled by age, or by any other cause. If the disease extends to the sub-aponeurotic plane of cellular tissue, then on the one hand the occipito-frontalis muscle may slough, while on the other the inflammation may be communicated to the brain or its membranes. These disastrous consequences seldom occur in idiopathic cases, but they are common after wounds.

Special treatment.—The head must be shaved. If the surface is doughy, and there is reason to think that suppuration has taken place in the sub-aponeurotic cellular tissue, free incisions must at once be made down to the bone, in a direction radiating from the vertex.

Erysipelas is not confined to the external parts of the body. It may affect the mucous or serous membranes, or the lining of arteries, veins, or lymphatics. The general character and tendency of the disease is essentially the same as when it attacks the skin or cellular tissue.

Erysipelas of the fauces may arise spontaneously, or as a consequence of the disease in some other part. In addition to the ordinary local symptoms—redness, swelling, &c., which manifest themselves upon the soft palate, uvula, and fauces—the voice and breathing are generally more or less affected. The disease is always an alarming one, and calls for active treatment. If the inflammation spreads to the lining membrane of the larynx, the case is almost hopeless.

Treatment.—The parts should be painted with a strong solution of nitrate of silver—30 or 40 grains to the ounce of distilled water—the patient should breathe a warm moist atmosphere, he should steam his throat from time to time, and make frequent use of stimulating, astringent, or disinfecting gargles. If it is apparent from the increasing dyspnœa, hoarse cough, and tenderness about the neck, that the inflammation is extending to the larynx, the question of laryngotomy or tracheotomy will have to be considered, and that without delay.

The difficulty of breathing and swallowing which accompanies this disease renders it a peculiarly exhausting one. The treatment must, therefore, be of a supporting and stimulating kind from the first.

Erysipelas of serous membranes.—Among serous membranes the arachnoid and the peritoneum are those which are most often attacked by erysipelatous inflammation. In either case the disease generally follows an injury, or an operation, or erysipelas of some contiguous part. Under any circumstances it is extremely fatal. The treatment must be conducted on those general principles which have already been indicated.

PYÆMIA

is the name given to a disease which is nearly related to the worst forms of surgical fever and erysipelas, and which manifests itself by well-marked constitutional phenomena of a febrile kind.

It is always preceded by suppuration, and it leads to the formation of abscesses in different parts of the body. Hence it has been supposed to depend upon the admixture of pus with the blood. But this theory is not altogether free from objections—1st. How, it may be asked, does the pus effect an entrance into the circulation? 2nd. It has been proved by experiment that pus may be mixed with the blood without producing pyæmia. 3rd. Though sometimes, on microscopic examination, the blood seems to contain pus globules, still it is very difficult to say with certainty whether they are pus-globules or white blood corpuscles.

On the whole it appears most probable that the pyæmic fever is generated by a poison which is absorbed from the suppurating surface, but which is much more subtle and delicate in its nature than pus. Hence the disease is now often spoken of as *septicæmia* —putrid infection of the blood.

When a person is about to be attacked by pyæmia, the wound usually becomes dry and unhealthy. The pus which is secreted is scanty and thin. At the same time there is increased frequency of the pulse and breathing. The temperature rises, and the patient has a rigor, more or less distinct. This is soon followed by a copious perspiration, and coincidently the temperature falls.

When the disease is fully established the complexion is sallow or leaden. The eyes sunken. The features pinched. The tongue dry and brown. The pulse quick and weak. The respiration hurried. The breath has a faint sweetish odour. The skin is moist, and, after a well-marked rigor, it is bathed in sweat. There are occasional shiverings, and wandering pains are felt in various parts. With all this there is great prostration, rapid wasting, and a tendency to delirium. The urine often contains albumen.

The secondary abscesses that are apt to form are usually met with in internal organs, particularly in the lungs and liver, or in the neighbourhood of joints; but they may appear almost anywhere. When they are situated in internal organs the disease generally runs a short and fatal course; but when they are in the neighbourhood of joints, or among the muscles, it may last for weeks or months. In these protracted cases the patient may either sink from exhaustion, or he may recover with more or less impairment of the structure or function of the affected part.

When the pyæmia has taken its origin from a wound which is discharging *fœtid* pus, the disease is usually particularly virulent.

Treatment.—As pyæmia is promoted by a want of fresh air, by overcrowding, and by unfavourable hygienic conditions, so it may be, in a great measure, prevented by free ventilation and plenty of cubic space.

In a case where it has declared itself, the first matter which must engage the surgeon's attention is, therefore, to secure thorough ventilation. In fact to immerse the patient in a fresh-air bath. The medical and dietetic treatment should be stimulating and supporting. The food should consist of beef-tea, and milk, with wine or brandy.

Ammonia, quinine, bark, and the chlorate of potash, are the remedies that hold out most hope.

Indeed the treatment of pyæmia may almost be summed up in the words—free support and free ventilation.

TETANUS

is a disease of the spinal nervous system. It may arise spontaneously (*idiopathic*), but much more often it follows an injury (*traumatic*).

It is characterized by tonic spasm and rigidity of the muscles, with frequent exacerbations. Sometimes the muscles of the neck and jaws are chiefly or solely affected (*trismus*). Sometimes the muscles of the back are so strongly contracted that the body is bent like a bow, resting on the head and the heels (*opisthotonos*).

The disease may be either chronic or acute. The chronic cases are generally idiopathic, and often recover. The acute cases are usually traumatic, and are very fatal.

Traumatic tetanus may follow a mere contusion, but much more frequently it is caused by a wound. Wounds of the hands and feet are particularly apt to give rise to it, perhaps because these parts are highly supplied with nerves. Ragged and dirty wounds are more dangerous in this respect than those which are made with a clean, sharp instrument. It often follows burns. The alternations of temperature, heat and cold, and the changes in the weather seem to have some share in favouring its production.

The disease may come on when the wound is in any stage, but most frequently it shows itself during the period of cicatrization. The symptoms are referrible to the true spinal system, and indicate extreme irritability. There are no unusual appearances at the seat of injury. Indeed, throughout the whole illness there are no local phenomena worthy of notice. The first symptom is pain and stiffness about the neck. This soon spreads to the muscles of mastication, deglutition, and respiration. Hence the popular name of the malady—lock-jaw. The muscles of the face are thrown into strong contractions, giving rise to a characteristic expression of countenance—the *risus sardonicus*. The disease next extends to the diaphragm. There is pain at the ensiform cartilage, shooting backwards and causing irregular and embarrassed breathing. Gradually the muscles of the abdomen, back, and lower limbs become affected. The whole body is stiff and rigid—perhaps strongly arched, resting upon the occiput and the heels. The arms and the tongue are among the last parts that are implicated.

With all this the cerebrum is unaffected; the mind remains clear. There is no fever. It is true the pulse is quick and the skin hot and perspiring, but this may be explained by the strength of the contractions, and the pain that accompanies them. The bowels are obstinately constipated.

Death takes place either from apnœa consequent upon spasm of the larynx, or from exhaustion. The morbid appearances do not throw much light on the nature of the disease. There is generally, but not always, congestion of the cord, with some degree of serous effusion. Dr. Lockhart Clarke has seen softening and disintegration of the grey matter. Mr. Erichsen has observed that some one nerve, leading from the seat of injury, will always be found distinctly congested.

Treatment.—When there is a suspicion of danger the wound should be excised; or a deep incision should be made round it on its proximal side, so as to divide its nervous connexions. But when once the disease is thoroughly established no local treatment seems to be of any avail.

The constitutional treatment should consist in the administration of a purgative—castor oil or calomel, for example—and this should be followed by enemata from day to day, as occasion requires. To moderate or suspend the muscular contractions the surgeon may try the effect of ice to the spine, or the inhalation of chloroform, or full doses of opium, Indian hemp, Calabar bean, chlorodyne, or choral. But hitherto no remedy has been found which appears to have any constant or uniform influence over the disease. What is most important of all is that the patient should have perfect quiet—that every possible source of irritation should be removed. At the same time he must have plenty of beef-tea, milk and other fluid food, with brandy or wine, to support his strength, and to resist the tendency to death by exhaustion.

Tetanus sometimes requires to be distinguished from poisoning by strychnia. Speaking generally, the symptoms of poisoning come on suddenly, and recur in paroxysms, with intervals of complete remission. The onset of tetanus is more gradual, but when once established it is persistent, though subject to exacerbations.

Hysteria sometimes simulates tetanus; but the imitation is seldom so complete as to give rise to much difficulty in the diagnosis.

HYSTERIA

is a disease of the nervous system, characterized by more or less disturbance of volition, sensation, and emotion. The mind has lost its firmness, and is a prey to morbid fancies.

It is a disease which affects women much more often than men.

It generally comes under the notice of the physician, but it is necessary that the surgeon should be aware of its manifestations, or it may betray him into serious errors of practice.

As we have just said, hysteria sometimes simulates tetanus, at other times it assumes the characters of spinal disease, or of disease of the joints or breasts, or of neuralgia, or of other complaints. Indeed, there is hardly a malady which may not be modified, if not altogether simulated by the hysterical temperament.

The collateral circumstances of the case, and a careful examination of the part when the patient's attention is directed to something else, will generally enable us to form a correct diagnosis, and to disentangle the real from the imaginary symptoms.

In treating such cases we must endeavour to improve the patient's general state by tonics and a change of air, as well as to brace the mind by giving it healthy occupation. All trifling amusements and all listless habits should be forbidden, and the patient should be encouraged to follow some branch of industry or learning, to devote herself to some active work of charity, or to practise diligently some accomplishment or fine art for which she may have a taste, and which, by engrossing her attention, will divert her thoughts from herself. If the occupation is one which necessarily takes the patient much into the open air, such as botany, geology, or sketching from nature, it is likely to be all the more beneficial. At the same time late hours should be prohibited, the patient should rise as soon as she awakes in the morning, and take a cold or tepid sponge bath. In short, a well-regulated dietary—using the word in the fullest sense which its derivation suggests, and including not merely the food taken, but the hours of meals, and the exercise and stated employments of the day—is essential to the recovery of the patient.

Having secured the observance of these, the most necessary, conditions, some mild local treatment may be used to satisfy the invalid. But we must carefully abstain from all such active measures as we should employ if the case was one of organic disease. There is no use in trying to argue the patient out of her morbid fancies. They are real to her, and must be treated as such. Any attempt to prove that they are merely the result of a diseased imagination will only aggravate the symptoms and make her cling to her delusion with all the greater tenacity. As Archbishop Whately justly observes—"When a person has a morbid fancy the worst course is to attempt to argue or reason him out of it; this only makes him the champion to defend it against all opponents. The only way is to lead the mind to other topics, and to insensibly cause it to be forgotten. That which did not come in at the door of reason will not come out of it."

PART IV.

DISEASES AND INJURIES OF VARIOUS PARTS—TISSUES AND ORGANS.

CUTANEOUS ULCERS.

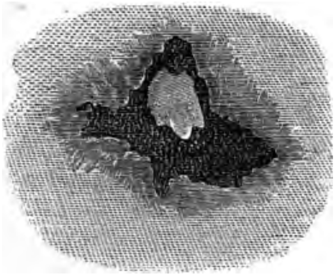
THE skin is liable to be affected by ulcers of various kinds. Their commonest situation is the leg, just above the ankle. The ulceration is the result of a local and circumscribed inflammation. Such inflammation may have either a *non-specific* or a *specific* origin, but in either case the ulcers are divided according to their characters into (1) healthy, (2) weak, (3) indolent, (4) irritable, (5) inflamed, (6) phagedænic.

1. The *healthy ulcer* is nothing more than a sore when it is granulating normally. The granulations are small, regular, close-set, of a deep rose colour, and highly vascular. The pus, which bathes the surface, is *laudable.* The edges have a bluish or bluish-white tint, and the margins have a tendency to contract.

The *treatment* of such an ulcer is of the simplest kind. A studied position, together with water-dressing, or a little simple ointment, is all that is needed.

When the sore is large, such as is sometimes left after an extensive burn, the healing process may be expedited by skin-grafting, in the manner recommended by M. Reverdin. A minute piece of healthy skin is raised with a forceps, cut off with scissors, laid upon the granulating surface, and secured in that position by a pad of dry lint and a strip of plaster. As many such grafts may be made as the size of the wound requires, but they should on no account be tried unless the ulcer is in a perfectly satisfactory state. The graft need not extend through the whole thickness of the skin. It is enough if rather more than the cuticle is taken. Fig. 24 represents such a graft on the twelfth day. The original piece of skin transplanted was about the size of a canary seed. It not only grew rapidly, but it seemed to stimulate the edges of the wound so that they rapidly approached one another, and the whole was soon healed over.

Fig. 24.



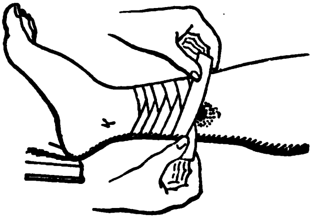
Skin-graft.

2. The *weak ulcer* is a degenerated form of the preceding. From some cause — constitutional or local — the granulations become pale, irregular, and flabby, and the discharge thin and serous.

The *treatment* consists in using stimulating applications—*e.g.*, ung. zinci, or ung. hyd. nit. or zinc lotion (F. 22), or nitric acid lotion (F. 10); while the part is supported by strapping or a bandage, and we try to improve the patient's general health.

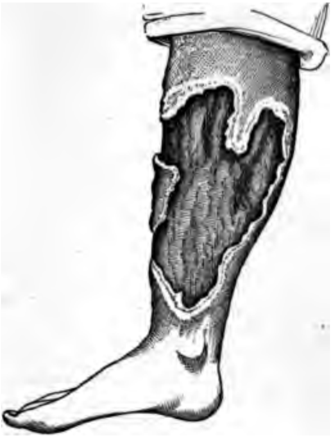
For strapping an ulcer of the leg the surgeon should provide himself with a number of strips of adhesive plaster, about an inch broad and long enough to go once and a half round the part. The patient should be directed to place his heel on the edge of a chair, and then the surgeon should apply the strips of plaster in regular order from below upwards, laying the centre of the strip on the limb opposite the ulcer, and bringing the ends round and crossing them over the dressings in the way represented in Fig. 25. The strapping should extend from a little below the ulcer to a little above it, and each strip of plaster should overlap the preceding one to a slight extent, so that there may be no intervals between them. After the strapping has been applied, the leg should be bandaged from the toes upwards, to give it firm and even support, and to prevent it from becoming œdematous.

Fig. 25.



indolent ulcer is often seen in old persons. Its most com- uation is the leg just above the outer or inner malleolus, and nes it attains an us size (Fig. 26). w surface is pale, , callous, and not a mucous mem- The edges are , thickened, hard, ite. The adjacent are indurated by dema. *treatment* consists roying the callous by a blister or by s, and then stimu- the ulcer by such and ointments ve been named while we depress ges by strapping daging. Indeed, eatment of ulcers reful strapping— method recom- d by Mr. Baynton nearly eighty years ago—is too much ted at the present day. When it can be thoroughly l out it is the most satisfactory way of dealing with a chronic Sometimes in obstinate cases, which are not dependent varicose veins, the operation recommended by Mr. Gay e undertaken. It consists in making an incision through in down each side of the ulcer, about half an inch from its n, so as to divide the thickened tissues, and allow the edges sore to approach one another. The incisions must be filled int to prevent them from closing too soon.

Fig. 26.



The *irritable ulcer* is shallow, with thin edges. The surface ts a number of irregular granulations of a dark-red colour, ighly vascular. It is accompanied by constant pain, is ely sensitive, and bleeds on the slightest touch. It pours a thin, acrid secretion, mingled with fragments of a greyish . Usually the whole surface has been irritated by the n of the patient's clothes, or some similar cause. According . Hilton, a spot may sometimes be found where the extreme ility resides; and then careful examination may detect nts of denuded nerves.

The *treatment* consists in removing everything that can fret the sensitive surface, and then touching the part thoroughly all over with nitrate of silver. This may be repeated every two or three days. During the intervals the sore should be dressed with sedative or anodyne applications—*e.g.*, ung. plumbi acetatis, or lead lotion with laudanum (F. 21).

Constitutional treatment is here of the utmost importance. The secretions must be regulated, the health improved by tonics, and nervous irritability allayed by sedatives or narcotics in full doses.

5. The *inflamed ulcer* may either arise from an aggravation of the original inflammation, or it may be induced by excessive stimulation.

The margins are red and swollen. The surface is soft and friable, emitting a profuse and unhealthy discharge. There is heat and pain in the part with constitutional febrile symptoms.

The *treatment* should be mildly antiphlogistic. Aperients and salines should be given, while the part is elevated, and constantly fomented or poulticed. To do this thoroughly the patient should lie in bed with his leg raised on a pillow, and protected from the bedclothes by a cradle. Sometimes leeches may be requisite. When the inflammation has been subdued water-dressing is all that will be needed.

6. The *phagedænic ulcer*, when it is not syphilitic, is merely an advanced stage of the foregoing. The ulceration spreads rapidly, the tissues breaking down and becoming disintegrated. When sloughs form round the margins of the wound, and the tissues perish *en masse* the disease is called *sloughing phagedæna.*

These varieties of ulceration are commonly accompanied by a good deal of pain and constitutional disturbance. They indicate that the patient is in bad health from some cause which depresses the system and vitiates the blood—the exhalation from drains, for example. They are frequently associated with syphilis.

The *treatment* consists in placing the patient in favourable hygienic conditions, restoring his general health, destroying the ulcerating surface by escharotics, and dressing the sore with antiseptic or stimulating lotions.

HOSPITAL GANGRENE.

It sometimes happens that sloughing phagedæna prevails as an epidemic in hospitals. It is then called *hospital gangrene.* At the present day this disease rarely occurs in civil practice. It is most frequently seen in naval and military hospitals when the wards are overcrowded and the cases very severe, and when it is impossible to pay proper attention to cleanliness and ventilation. These are the conditions under which it originates.

When once established, it is very prone to spread, the poison being conveyed from one person to another either directly by sponges, dressings, &c., or indirectly through the atmosphere.

It may supervene upon a wound of any kind, or even on a mere bruise.

The edges of the wound become painful, swollen, and livid; a greyish slough covers the surface; the discharge becomes thin and scanty.

If the disease is not checked, the surrounding tissues soon become gangrenous, and this destructive action spreads with fearful rapidity. Bones may be exposed; or vessels may be opened, and copious hæmorrhage may ensue. These local symptoms are accompanied by great constitutional disturbance.

Treatment.—The patient should, if possible, be placed in conditions more favourable to health. The sloughing surface must be destroyed with strong nitric acid or with the actual cautery, and the resulting wound treated on general principles. The strength must be upheld by a generous diet and stimulants, while pain is allayed by opium or similar drugs. It is hardly necessary to add that everything should be done to prevent contagion and to disinfect the atmosphere.

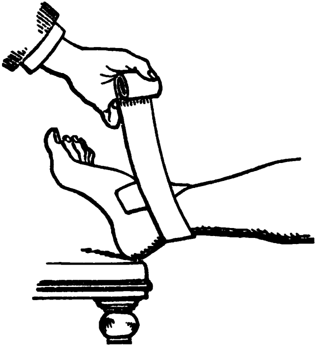
VARICOSE ULCERS.

A great many ulcers on the legs are due to the presence of varicose veins. All such ulcers, whatever other characters they may have, are called varicose ulcers.

The special *treatment* must have reference to the dilated condition of the veins—while the limb is in a state of passive congestion from the retardation of the venous current it is almost impossible to cure the ulcer. In some cases the varicose veins admit of being obliterated. In other cases the surgeon must be content to support them by means of a bandage or an elastic stocking.

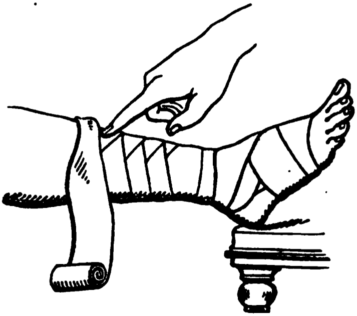
As the surgeon has often to bandage the leg not only for varicose veins, but also for many other conditions, we shall take this opportunity of explaining how it should be done. Let us suppose that the right leg has to be bandaged. The patient should be allowed to sit in an easy position with his heel supported upon a chair and his foot placed in the mid-position between flexion and extension. The surgeon then takes the bandage in his right hand, and lays the external surface of the

Fig. 27.



roll on the inner ankle. Then with his left hand he draws out a few inches of the end of the bandage, and this free extremity he conducts round the back of the ankle, and lays it across the dorsum of the foot. (Fig. 27.) He then brings the roller across the instep and over the extremity of the bandage. In this way he secures the end, and obtains a fixed point to start from. He then carries the roller round the outside of the foot, keeping the roll of bandage close to the skin, and makes one or two circular turns round the foot, a little above the roots of the toes. The bandage is next brought up on the inside of the arch, taken over the dorsum, then round the ankle, and brought obliquely across the instep to the outer edge of the foot. It is now carried under the sole as before, then obliquely across the dorsum, and on reaching a point immediately above the ankle the bandage is conducted in simple circular turns round the small of the leg until it reaches the calf, where "reverses" will be required in order to make it lie

Fig. 28.



evenly (Fig. 28). The "reverses" ought not to be placed over the shin, but a little to its outer side. When the bandage has reached the upper part of the calf it should be finished off with one or two circular turns, and fastened on the outside of the leg.

There are various ways of commencing this bandage. Some surgeons begin by laying the end of the roller upon the instep; others upon the outer edge of the sole; but all agree in bringing up the bandage on the inside of the foot so as to support the arch.

When it is necessary to cover the heel the surgeon should use an "arm-bandage," because a "leg-bandage" is rather too broad to adapt itself readily to the part; and a flannel roller will generally be found better suited to the purpose than a calico one. The bandage should be applied to the foot in the ordinary way, only more turns will be required, and it will be necessary to apply them more closely over the heel. It is always a difficult matter to cover the heel evenly, and the aid of a few stitches may sometimes be needed to enable the surgeon to do it in such a manner that the bandage shall keep its place for any length of time.

But to return to the subject of varicose ulcers. In every instance rest in the horizontal position with the leg raised upon a pillow, so that it may be a little higher than the hip, should form an important element in the treatment. The patient should be warned against standing much. A brisk walk is not nearly so harmful as "hanging about on the feet." The general treatment of the sore must be conducted on the principles already laid down and according to its peculiar characters.

Mr. Hilton recommends that those who have varicose ulcers should raise the foot of the bedstead, on which they habitually sleep, a few inches from the ground. By this simple device an ulcer which has once been healed may be prevented from breaking out again.

BOIL.

A boil (*furunculus*) is a limited and circumscribed inflammation of the true skin. It often originates in a sebaceous follicle. It is attended with considerable pain. It runs on quickly to suppuration, bursts, and discharges its contents by a single orifice. Sometimes the boil is single, but more frequently a number appear at once or in succession.

It depends upon a vitiated state of the blood from living too high, or living too low; from a want of proper exercise; or from a want of cleanliness. Sometimes it is excited by local irritation, as every oarsman knows. Some persons are subject to boils every spring, depending apparently upon the feeble state of health into which they fall at that season.

Boils generally show themselves on the trunk, more particularly in those situations where the skin is thickest, as the shoulders and buttocks.

The *treatment* consists in clearing out the bowels, and afterwards regulating the secretions. The diet should be light, nutritious, and unirritating. Tonics, such as the mineral acids, quinine, or the preparations of iron or of arsenic, should be prescribed. A change of air will generally be found very beneficial.

Locally the boil should be fomented or poulticed until suppuration takes place. It should then be opened, and the poultices continued. If a hard indolent swelling remains, it should be rubbed with a stimulating ointment, or painted with tincture of iodine.

CARBUNCLE

(*anthrax*) is also a local and circumscribed inflammation of the skin, but more extensive than a boil and more severe in its symptoms.

The affected part becomes of a dull red colour, slightly raised, brawny and intensely painful and tender. In two or three days it suppurates, and discharges pus from a number of points. Large portions of the skin, and of the subcutaneous cellular tissue slough, and a foul, irregular sore is left.

With this there is more or less constitutional disturbance, generally of an asthenic kind.

Carbuncle occurs most frequently on the back of the neck, the shoulders, and buttocks. It is distinguished from a boil by its greater size, by its proneness to spread, by the flat elevation which shows no tendency to " point," and by the number of openings from which the discharge escapes.

It is a disease of middle and old age, and depends upon a faulty condition of the blood. It is rare to see more than one carbuncle present in the same individual. The prognosis will depend upon the size and situation of the carbuncle, but yet more upon the soundness of the viscera—especially of the kidneys.

Treatment.—An aperient should be prescribed at the outset, and followed by alteratives and tonics as occasion requires. Opium, or drugs of the same kind, will have to be given in full doses. A nutritious diet with stimulants will be needed from the first.

The local treatment consists in making a free crucial incision, or several small straight ones, across the affected part. This should be done early, so as to save the skin. A poultice should then be applied to hasten the separation of sloughs. Some surgeons prefer to open the carbuncle by the application of potassa c, calce, or nitrate of silver. Sometimes the unhealthy action spreads, and it becomes necessary to make further incisions, or to apply caustics. When the sloughs have all come away, and the raw surface has assumed a healthy character, it must be treated on general principles. The healing process is usually slow and tedious.

RUPTURE OF MUSCLES OR TENDONS.

Muscles or tendons are sometimes ruptured by sudden and violent action. The muscles of the limbs are most liable to this accident. The *tendo Achillis* is particularly apt to give way. Sometimes, however, the muscles of the trunk are torn across—*e.g.*, in tetanus.

The symptoms are sharp pain, sometimes accompanied by a snapping noise, loss of power, and a palpable depression in the continuity of the muscle or tendon.

In the *treatment* of such cases the great object is to relax the muscle or tendon, and to approximate the torn surfaces. The part should be kept at perfect rest in this position for a month, and then passive motion should be cautiously made. When the *tendo Achillis* is ruptured the leg should be flexed at the knee, and retained in that position by a cord connected at one end with the heel of the patient's slipper, and at the other with a bandage passing round the thigh. For some time after he begins to move about he should wear a high-heeled shoe.

Repair takes place by the effusion of plastic material within the sheath, and this material gradually becomes organized into a structure resembling tendon.

SPRAINS.

A sprain consists in the sudden and forcible stretching of the tendons or ligaments connected with a joint, without dislocation. Sometimes the tissues are more or less lacerated. The accident is accompanied by severe pain, and followed by rapid swelling. It is always troublesome and tedious, and may lead to serious results.

The *treatment* should aim at preventing inflammation, promoting absorption, and restoring healthy action. During the first stage the part should be kept at rest in an elevated position, and cold continuously applied. If, notwithstanding, there is inflammation, fomentations should be used—perhaps even leeches may be required.

As soon as the acute symptoms have subsided, absorption should be promoted by systematic rubbing, with or without stimulating liniments or ointments, or by the pressure of a well-adjusted bandage. If the patient is of a rheumatic or a gouty habit of body the bicarbonate or the nitrate of potash, with colchicum or the iodide of potassium, should be prescribed. (F. 46, 51, 54.)

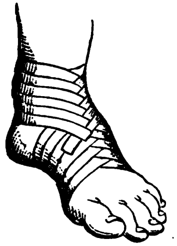
Gradually passive motion may be begun in order to restore the part to its proper functions, and the patient may be allowed to make moderate use of the joint. If any stiffness remains warm salt water douches, or a visit to the thermal springs of Bath, Aix-la-Chapelle, or Barèges is often attended with benefit.

Sprained ankle.—Sprains of the ankle are so common, and so important, that their treatment deserves a special mention.:

If the patient is seen soon after the accident, nothing more is required in many cases than to support the part by applying a roller from the toes to a short distance above the ankle, or by strapping and a bandage.

When the ankle has to be strapped, the surgeon should provide himself with a number of strips of the common diachylon plaster, about an inch wide and long enough to encircle the part. These should be well warmed by holding them before the fire, or by dipping them in hot water. The patient should then be directed to place his foot upon the edge of a chair, and the surgeon should apply the first strip of plaster across the sole of the foot, immediately above the roots of the toes, bringing up the ends on each side, and crossing them on the instep. Thus he applies one strip after another, each strip overlapping the previous one by about a third of its breadth, until the whole of the anterior portion of the foot has been covered. The next strip he passes behind the leg, applying it immediately above the heel, and bringing the ends forward, one on each side, and crossing them in front of the ankle. In this way he places as many strips as may be necessary, each strip rising a little higher up the leg than its predecessor. The plaster should be applied firmly, so as to make a slight degree of pressure, and if the strips are properly placed it is only the point of the heel which will be left uncovered. As a

Fig. 29.



rule the narrower the pieces of diachylon, the more closely will they adapt themselves to the shape of the part, and the more even will be the support which they afford. If the plaster does not lie flat, or if its edges press unduly upon the skin, and impede the circulation, it should be nicked in different situations with a pair of scissors. It is a good plan to apply a narrow flannel or calico bandage over the strapping, so as to fix the plaster and give additional support to the limb.

If, however, the sprain is not seen until effusion and swelling have taken place, then it may be necessary to confine the patient to the sofa, to enjoin rest, and to use warm or cold applications according to the circumstances of the case. Sometimes a poultice or a fomentation will be found to give most relief; but at other times the surgeon will have to try the effect of a spirituous lotion or a bag of pounded ice. After the acute symptoms have been subdued, the pressure and support which are afforded by a well-adjusted bandage will be found of great benefit. A flannel or cotton elastic roller is best suited to such cases; or an elastic gaiter may be worn with great comfort. The patient should be encouraged to use his ankle in order to prevent the formation of adhesions about the joint.

WHITLOW

(*paronychia*) is an acute inflammation at the point of the finger. It may be considered under two degrees. The first and most severe form is that which affects the tendons and bone; the second involves only the skin, the matrix of the nail, and the subcutaneous cellular tissue.

1. In the most severe variety of whitlow the inflammation is deeply seated from its commencement. It begins in the sheath of the tendons, or in the periosteum. The redness and swelling extend to the hand and forearm. The tension is great. The pain is intense and throbbing. The patient gets no rest by night or by day, and is worn out by the severity of his malady. Matter forms in the course of a few days, but it takes a long time to make its way to the surface, and in the meanwhile the vitality of the bone will probably be impaired.

2. The milder form of the disease generally originates in the pulp of the finger or in the matrix of the nail. The patient, who is probably out of health at the time, receives a prick, or a poisoned punctured wound, near the end of the finger. The part begins to swell, and becomes hot, red, and painful. These symptoms increase in severity until matter forms, and discharges itself. The nail will probably be thrown off, and its place gradually supplied by a new one.

In both these varieties of whitlow there is more or less constitutional disturbance, according to the severity of the symptoms. The bowels are constipated, the tongue furred, and the pulse quick. At the same time the blood is probably in an impure state, either from over-living or from a want of proper nourishment.

Treatment.—The hand should be supported by a sling in an elevated position so that the finger-ends point towards the opposite shoulder. The bowels should be freely opened, and an antiphlogistic regimen adopted as long as the acute symptoms last. The part should be constantly poulticed with linseed meal. As soon as suppuration has taken place, a free incision should be made; if possible, at the side of the finger, so as not to impair its tactile power, or to interfere with its future usefulness. While the inflammation is at its height sedatives must be freely given to mitigate pain and procure sleep.

If the bone is necrosed, it may have to be removed, in whole or in part, before the sore will heal. In such a case the soft tissues should always be left, and supported on a small finger-splint. Even if the entire phalanx has come away, the skin and nail will make a very useful point to the finger.

When the thecal inflammation has been extensive the tendons are apt to become attached to their sheaths, and the utility of the finger is more or less impaired. Sometimes it is left stiff and straight, sometimes it is contracted. In such cases soaking the hand in warm water, rubbing the finger with soap liniment, and making as much use of it as possible will be likely to do great good. Forcible flexion and extension under chloroform may sometimes be practised with benefit. As a last resource, when the stiffness cannot be cured, and is interfering with the patient's livelihood, amputation may be performed.

If the inflammation spreads to the hand and forearm, as it occasionally does, it must be treated on general principles.

When the acute symptoms have been subdued, a course of tonics and a change of air will be of great service in restoring the patient's health.

GANGLION

is the name given to an encysted tumour connected with the sheath of a tendon.

Such ganglia are of two kinds, *simple* and *compound.*

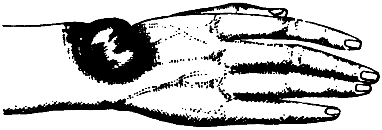
Simple ganglia are circumscribed tumours, formed in the fringes of the synovial membrane. Compound ganglia are collections of fluid in the sheath of the tendon itself.

Each variety of the disease appears under an acute and a chronic form. Ganglion is often caused by a blow or a strain, but more frequently it arises spontaneously. The chronic form of compound ganglion is sometimes the result of tenosynovitis.

The fluid contained in a ganglion is straw-coloured and viscid, like synovia. Sometimes it is brown from the admixture of blood. Sometimes it contains fibrinous bodies, like melon seeds, floating in it.

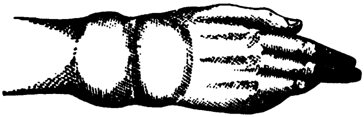
The tumour presented by a simple ganglion rarely exceeds the size of a small walnut (Fig. 30). It is smooth and rounded, elastic and translucent. It grows slowly and without pain, but as it increases in size it may give rise to a good deal of inconvenience by interfering with the action of adjacent parts. It may even cause acute pain and sensitiveness by stretching the nerves that pass over it.

Fig. 30.



The simple ganglion generally forms in connexion with the extensor tendons of the ankle or wrist. The compound is often associated with the flexor tendons, or with both the extensors and flexors at the same time. Fig. 31 represents a compound ganglion of the wrist. The patient, a young woman, was a laundress, and the disease was probably brought on by wringing clothes, and using heavy irons. Both wrists were similarly affected, and both the flexor and extensor tendons were involved.

Fig. 31.



Treatment.—A *simple* ganglion may frequently be ruptured by pressure or by a smart blow, and then the contained fluid is absorbed. Or it may be painted with tincture of iodine, or smeared with a mercurial ointment, or with an ointment composed of equal parts of ung. hydrarg. and ung. iodi, or blistered. While any of these measures are being adopted it should be firmly bandaged so as to promote absorption, and fixed upon a splint, so that it may have perfect rest.

If these means fail, the tumour may be punctured by a subcutaneous valvular incision, the contents let out into the surrounding tissues, and pressure again applied. Or the tincture of iodine may be injected, or the lining membrane scarified so as to set up adhesive inflammation. Or a couple of silk threads may be passed through it, as a seton; or it may be laid open and allowed to heal from the bottom; or, as a last resource, the cyst may be dissected out.

The *compound* ganglion is a more severe affection, and will generally be found very obstinate. It must be treated on the same principles as the simple variety. The effect of rest, pressure, and counter-irritation must be patiently tried. If these means fail a seton may be introduced, or tincture of iodine injected, or the cavity laid freely open. But operative measures must not be undertaken without great caution. If diffuse suppuration should occur in the sheath of the tendon, the most serious consequences might ensue.

TENOSYNOVITIS.

Sometimes the sheaths of tendons become acutely inflamed (*tenosynovitis*). Such inflammation is generally caused by sprains, or by the violence which gives rise to dislocations.

In addition to other symptoms of inflammation—heat, pain, tenderness, loss of power—there is more or less swelling along the course of the tendon, arising from effusion into the sheath.

When the surgeon examines the part a peculiar creaking sensation is communicated to his hand. This *creaking of effusion* has sometimes to be carefully distinguished from the *crepitus of broken bone.*

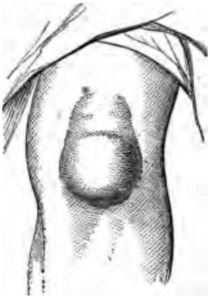
Treatment.—The local treatment of acute inflammation of tendinous sheaths consists in rest, fomentations, leeches, and blisters. If the disease becomes chronic it must be dealt with as a compound ganglion.

INFLAMMATION OF BURSÆ.

Bursæ may become acutely inflamed from external violence, irritation, or undue pressure. The bursa over the patella is that which is most often affected in this way, constituting what is known as *housemaid's knee* (Fig. 32). The bursa enlarges. There is excessive secretion, and the secreted fluid is apt to become purulent. The tumour is elastic, very painful and tender to the touch. The skin is hot, red, and œdematous. With this there is generally pyrexia—a quick pulse, a white-coated tongue, and constipation.

Treatment.—The patient should have a light, unstimulating diet, and the bowels should be kept freely open. The part should have perfect rest, the limb being fixed upon a splint, and raised on a pillow. Fomentations or poultices should be constantly applied, and, if need be, leeches. If suppuration takes place, an incision should be made at once, and the case treated as an acute abscess. The opening should be over the centre of the patella, and the direction of the incision should be vertical.

Fig. 32.



Housemaid's Knee.

If the inflammation is chronic—if there is an indolent swelling which gives inconvenience, but which is not attended by acute symptoms—it should be treated by a back-splint and the pressure of a bandage. At the same time it may be painted with iodine tincture or liniment; or covered with the emp. ammoniaci c. hydrargyro, or with lint spread with ung. hyd. iodidi rubri; or it may be blistered; or a seton may be passed through it; or, if the tumour is so solid that it resists all milder measures, it must be excised.

EXOSTOSIS

signifies an outgrowth from bone. It is met with under two forms. Sometimes it is of ivory hardness, composed entirely of the dense tissue of bone; sometimes it is soft and spongy, and has the structure of the cancellated tissue, enclosed in a shell of hard bone, and overlaid with a thin cartilage.

The *ivory exostosis* generally springs from the flat bones, particularly those of the head and face.

The *cancellated exostosis* is usually connected with the long bones. It is most frequently met with about the lower end of the femur, and the upper end of the tibia.

Exostosis is a disease of early adult life. Tumours of this description are often multiple. Sometimes they seem to originate in the inflammation caused by external violence; sometimes they are found at the tendinous insertions of muscles; sometimes they result from the bony transformation of a fibrous or cartilaginous tumour connected with the periosteum; frequently they arise without any assignable cause.

An exostosis grows without pain, though it soon begins to cause inconvenience by the pressure it exerts on the neighbouring parts. It forms a smooth, globular tumour, hard to the touch and immovable. Sometimes it is attached by a broad base; at other times it springs from a narrow pedicle. A bursa is often developed between it and the tissues which lie over it.

Treatment.—Constitutional remedies are not likely to be of much use; still the iodide of potassium (F. 50) or the corrosive sublimate (F. 44) should be given, in the hope of promoting absorption, or at least of arresting growth.

The part should, as far as possible, have perfect rest. If the tumour is situated on one of the limbs a light splint should be applied, and everything should be done to allay inflammatory action. Not unfrequently exostoses cease to grow, and remain stationary for years.

If, in spite of our efforts, the growth goes on increasing, and gives rise to serious inconvenience, the question of extirpation must be considered. If circumstances permit, an incision should be made down to the tumour, and it should be removed with Hey's saw or with bone-pliers; or it may be enucleated in the manner described by Sir James Paget (*Med. Chir. Trans.*, vol. liv.). Such an operation will probably be followed by a good deal of inflammation, and should therefore be undertaken with caution. As the disease is purely local in its character it is not likely that it will reappear after it has been once thoroughly removed.

RICKETS

(*rachitis*) is a disease of the bones depending upon a constitutional disorder allied to scrofula.

It would appear that the animal constituents of the bones are normally deposited; but there is a deficiency of the earthy salts, and at the same time an expansion of the cancellous structure.

Rickets is an affection of early life, and generally shows itself about the period when children begin to walk. The natural curves of the bones are increased, the shafts do not lengthen as they should, and the articular ends become enlarged. These characteristics are most apparent in those bones that have to bear the weight of the body—the lower limbs, the pelvis, and the spine. The legs are short, thick, and bent forwards and outwards. The pelvis becomes compressed and deformed; and, towards the approach of puberty, the spine not unfrequently shows signs of lateral curvature. An expansion of the cranial bones and a prominence of the forehead are also very characteristic of rickets. In process of time the shafts of the long bones become strengthened by increased deposit of osseous matter on their concave sides. After puberty the constitution generally undergoes a change, and the disease makes no further progress.

Treatment.—As the disease is a constitutional one, our treatment must be directed mainly towards improving the general health. The child should have plenty of fresh air and sunlight, good and sufficient food, warm clothing, and regular exercise. He should have a tepid, cold, or sea-water bath every morning, and friction should be applied to the surface of the body to promote the action of the skin, and the development of the muscles. The secretions should be carefully regulated, and tonics prescribed—especially cod-liver oil and the preparations of iron. Lime-water with milk sometimes seems to have a beneficial influence, and Parish's "Chemical food" is an excellent remedy.

As long as the disease is progressing the child must not be allowed to stand or walk much—indeed, the less the better. While indoors he should lie on a couch, or on a mattress spread upon the floor, or be encouraged to creep "upon all fours." When in the open air he should be driven in a carriage, or wheeled about in a perambulator, or he should ride a donkey or a pony.

If the spine is affected the patient should lie down once or twice a day for an hour or two upon a hard, flat sofa. A light mechanical appliance should also be worn so as to take the weight off the vertebral column, and to press upon the out-growing part.

In the same way if the legs are becoming bent, and if it is impossible to take the child entirely off its feet, he should wear steel supports, which will have the advantage of enabling him to take exercise in the open air, while they prevent the deformity from increasing.

MOLLITIES OSSIUM

(*malacosteon, osteomalacia*) is another disease which seems to depend upon a want of the earthy constituents of the bone; but here it appears that there is degeneration of the animal matter as well. The bones become soft and brittle, and are often distorted into shapes that cause the patient great inconvenience and distress. Death generally takes place either from exhaustion, or from compression of the lungs.

Mollities ossium occurs more often in women than in men, and it is particularly associated with the child-bearing period. Unlike rickets, it is a disease of adult life; and, when once it has commenced, it gets gradually worse. It may be confined to a few bones, or it may affect the entire skeleton. The urine is commonly loaded with phosphates, which are absorbed from the bones and excreted by the kidneys.

After death the bones are found to be light, soft, and greasy. They can be easily broken, or cut with a scalpel. The cancellated tissue is often expanded, and the interspaces filled with semifluid fat.

All that we can do in the *treatment* of this disease is to endeavour to improve and support the general health. No remedy has yet been found which has any specific influence over the malady.

PERIOSTITIS

signifies inflammation of the investing membrane of bone. It is often caused by exposure to cold, or by external violence; but still more frequently by an impure state of the blood arising from syphilis, scrofula, or rheumatism.

The subjacent layer of bone partakes in some degree of the inflammation. There is more or less *osteitis*. And similarly, when the bone is primarily inflamed, there will be more or less periostitis.

When the disease is acute the periosteum becomes thickened by the active congestion and the inflammatory effusion. There is intense pain, and exquisite tenderness. The part swells and the skin around becomes red and œdematous. In the course of two or three days suppuration takes place, and then the membrane becomes detached from the subjacent bone.

When the inflammation is chronic, a flat, hard, circumscribed tumour—*a node*—forms. There is deposit of plastic material in the periosteum and neighbouring parts. There is great pain, which is worse at night. Chronic nodes are generally of syphilitic origin, and when such nodes are situated on the flat bones—the cranium for example—they speedily suppurate, but when on the long bones, the formation of matter is comparatively rare.

Acute periostitis is attended by severe constitutional disturbance. In the chronic form there are generally syphilitic or rheumatic symptoms.

The local *treatment* of acute periostitis consists in an elevated position, leeches, and fomentations.

When suppuration takes place, an early and free incision should be made, and poultices applied. Under any circumstances necrosis and exfoliation will most probably ensue.

The constitutional treatment is that of acute abscess.

. The chronic form of node, if it depends upon syphilis, is generally reduced by iodide of potassium or mercury. Locally, iodine tincture or blisters are of great service.

OSTEITIS.

Bone, as well as the soft tissues, is liable to inflammation, and such inflammation may be either *acute* or *chronic.*

Acute inflammation of bone is generally more or less diffuse. Its favourite seats are the shafts of the long bones. When it extends to the medullary membrane it runs rapidly along the whole length of the canal. It occurs most frequently in children of a scrofulous constitution, and in those who are out of condition from want of the necessaries of life. It is often caused by exposure to cold and damp.

The attack is ushered in by rigors and a high degree of fever. There is severe deep-seated pain in the limb, rapid swelling, and œdema, with an erysipelatous blush on the surface. The inflammation runs on quickly to suppuration, and matter points in various situations.

If the patient recovers from the immediate violence of the attack there is always more or less necrosis of the bones. When the inflammation has spread along the medullary membrane, it is probable that the articular ends will suffer as well as the shaft.

The *treatment* of acute cases consists in opening the bowels freely, and then endeavouring to moderate the febrile symptoms by salines, while Dover's powder and other sedatives are given to allay pain. The part should be elevated, and constantly fomented. Leeches may sometimes be employed with advantage. As soon as matter forms it should be let out by direct incision, and poultices applied.

When the inflammation is chronic the bone becomes slowly thickened, and perhaps elongated. The bone-tissue becomes dense and compact like ivory. Iodide of potassium internally, with local counter-irritation, is the treatment which holds out the best hope of relieving this obstinate disease. Erichsen recommends in addition that a linear incision should be made down to, and through, the affected bone.

Occasionally a circumscribed suppuration takes place: an abscess is formed in the bone. Such abscesses are small; they contain pus mixed with the débris of the osseous tissue. Their most common situation is the cancellous structure at the upper or lower end of the tibia. They may generally be traced to an injury. The skin is not altered in appearance, but the part swells somewhat, and becomes thickened. There is aching, deep-seated, intermittent pain, which is always worse at night, and which is aggravated on pressure. The patient can lay his finge on the spot which gives rise to all his distress, and to that spo the symptoms are invariably referred.

The *treatment* of such an abscess consists in exposing the bon by a crucial incision, and then perforating it with a trephine, s as to give vent to the pus, and allow the cavity to heal.

CARIES

is commonly described as the molecular death and disintegration of bone.

It would appear that the nutrition of the bone undergoes a morbid change. The bone-tissue becomes soft and vascular. Presently it breaks down, ulcerates, and is discharged in the form of pus, mingled with minute fragments and spicula of bone.

Caries is very apt to begin in the deep layers of bone, in the centre of the cancellated tissue—perhaps because the circulation there is feeble. This description of caries is very common in persons who are of a strumous habit of body.

Sometimes, on the other hand, it attacks the surface of flat bones. Here it produces an extensive sore, but never penetrates to any great depth. To this kind of caries the term *ulceration of bone* is sometimes applied. It is often seen on the surface of the cranium, as a consequence of syphilis (see Fig. 120).

The early symptoms of caries are much the same as those of abscess. There is pain and tenderness, redness and swelling. Presently an abscess forms and discharges itself. It is then found that the pus is gritty and offensive. If a probe is passed along the track of the abscess, it comes in contact with the surface of the bone, which is stripped of its periosteum, and feels rough and excavated.

The appearance of a part affected with caries is very characteristic. The tissues are thickened; the skin glazed, and of a dusky red; while here and there are the openings of sinuses, which discharge a thin and unhealthy pus, and are commonly surrounded by coarse granulations. It is evident at a glance that the disease is of a chronic inflammatory character, and is due to some permanent source of irritation.

Treatment.—The first thing is to ascertain whether the disease depends upon a strumous habit, a syphilitic taint, or any other special cause of debility. If it does, we must endeavour to meet this condition by appropriate remedies. Many cases of caries improve with the improvement in the general health, and ultimately undergo a spontaneous cure. Everything therefore should be done which can contribute to this desirable end. The part should, if possible, be kept at rest by a moulded splint of leather or gutta-percha (see Figs. 44 and 46). The patient should have a change of air; if possible, he should go to the sea-coast; he should have a light but nutritious diet, and take regular exercise in the open air. At the same time alteratives should be prescribed, together with cod-liver oil, or the preparations of iron or of iodine, as the case may require. Locally counter-irritation by means of iodine tincture, blisters, or stimulating liniments should be used.

If, notwithstanding these means, the disease still continues in a chronic and intractable form, we must consider whether the case admits of an operation.

The simplest operation consists in removing the affected surface of the bone, in the hope of arresting the unhealthy action. This may be done by enlarging any fistulous tracks which may exist, and taking away the carious portions of bone by means of a gouge or other suitable instrument. The diseased bone is soft and friable, and crumbles easily under pressure, while the healthy bone is firm, and offers a natural amount of resistance.

If the operation is followed by healthy action, the wound soon heals by granulation.

In some cases the gouge is inadequate to the occasion, and excision or amputation will have to be performed.

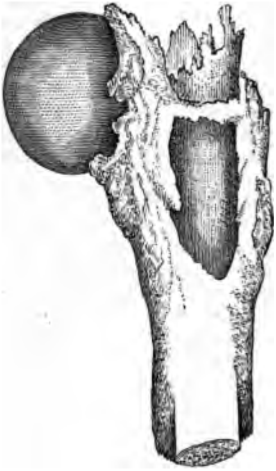
NECROSIS

is the term given to the destruction of bone in mass. When portions of the bone-tissue perish as a whole, without undergoing disintegration, they are said to necrose.

Necrosis affects chiefly the hard structure of bone, and the shafts of the long bones more often than their articular extremities. In these two points it is contrasted with caries. Fig. 33 was taken from a boy, aged 14, who died of acute necrosis of the humerus and tibia.

As in the case of caries whatever lowers the vital powers—exhausting disease, syphilis, scrofula, &c.—predisposes to necrosis.

Fig. 33.



Acute necrosis of the Humerus.

It is generally excited by injury, and hence it is more frequent in certain exposed situations, as the shin, than elsewhere. It is very apt to follow the spontaneous inflammation of bone, or acute periostitis. Those who work among the irritating fumes of phosphorus, as lucifer-match makers, are particularly prone to necrosis of the lower jaw.

When a shell or scale of bone separates from the surface, it is called an *exfoliation;* when a portion of the deeper tissue perishes, it is termed a *sequestrum.*

A case of necrosis may be divided into two stages—1. That of death and separation; 2. That of renovation and repair.

1. The symptoms which attend the death of bone are those of acute local inflammation—great pain and tenderness, swelling and œdema, and suppuration. By the severity of the attack, the vitality of the bone-tissue is destroyed; and then, in its turn, the dead piece of bone acts as a foreign body, and keeps up the inflammatory action, whereby it is separated and thrown off. The separation of a piece of dead bone is effected much in the same way as the separation of a slough in the soft parts. A line of demarcation is formed between the living and the dead tissue. Along this line disintegration and absorption are carried on, until separation is complete.

2. As soon as the dead bone has been detached from the living, and even before this has taken place, the process of repair begins. Granulations spring up from the healthy surface, pushing before them the exfoliated bone. This is one of the chief means that nature adopts for ridding herself of that which has now become a foreign body. But it often happens, especially when the sequestrum is of large extent and irregular in its outline, that the new bone grows around it and embraces it in such a way as to prevent its separation. Hence it is that the time required for nature to throw off dead bone varies extremely. Sometimes two or three weeks are sufficient; while, in other cases, the process is not completed at the end of months or years. Solly relates a case of necrosis, after fracture, in which exfoliation was still going on after the lapse of thirty years (*Surg. Experiences,* p. 307).

If the suppuration, which necessarily takes place, is very profuse, hectic may be induced, and the patient may die, worn out by the exhausting discharge.

From what source is the new bone produced? Partly from the sound and healthy bone which is left, and more particularly from the epiphysal extremities; partly from the periosteum and medullary membrane; partly from the granulations which spring from the surrounding soft tissues. When the periosteum is left, it supplies the principal part of the new bone—this has been demonstrated by Ollier of Lyons—but when it is destroyed, repair takes place by granulation from the other adjacent tissues. When the shaft of a long bone perishes, and bridges of new bone are thrown across it, the apertures or interspaces are called *cloacæ*.

Treatment.—The first thing to be done is to endeavour to remove the predisposing cause—be it scrofula, syphilis, general debility, or anything else. The principles upon which this is to be done, have been already laid down in speaking of caries.

If the necrosis has been caused by the fumes of phosphorus, the patient should at once be removed from their influence. The next point is to support nature in her efforts to throw off the dead bone. Everything should be done which can improve the general health, limit the suppuration, and husband the patient's strength. It is astonishing how great an amount of destruction will sometimes be repaired by the efforts of nature alone. We occasionally see cases where the foot is fixed, puffy, and œdematous, and the tissues of the leg thickened, glazed, and riddled with sinuses, restored to a sound and healthy condition by very little more than perfect rest in the horizontal position; the leg being raised on a pillow, or suspended in a "Salter's swing" (see Fig. 68), and treated with poultices, water-dressing, or stimulating lotions.

Until a line of demarcation has formed, it is impossible to say how much or how little of the bone has lost its vitality. The surgeon, therefore, should not interfere until nature has completed the work of separation. When, however, the sequestrum is deeply situated, it is no easy matter to say whether it is detached or not. Under these circumstances, a tentative operation may be undertaken after the lapse of a moderate time.

In some cases, a very slight force suffices to remove large portions of dead bone. Little or no injury is done to the soft parts, while the cure is greatly hastened. In other cases sinuses have to be opened, bridges of new bone have to be divided, and, after all, the sequestrum may be very imperfectly removed.

When the necrosis is situated in the extremities, if it is very extensive, or if it is attended with much disorganization of the soft tissues, or if the suppuration and hectic threaten to prove fatal, amputation will have to be considered. In some of these cases the limb may be saved by a resection.

FRACTURES

are caused either by *external violence* or by *muscular action*.

External violence may be either *direct* or *indirect*. When a bone is broken by direct violence, the fracture takes place at the seat of injury. When it is broken by indirect violence, the fracture may take place anywhere between the seat of injury and the point of resistance—as when the clavicle is broken by a fall on the shoulder.

The bone which is most frequently broken by muscular action is the patella. It is torn across by the strength of the quadriceps extensor muscle at the moment when it is stretched across the condyles of the femur.

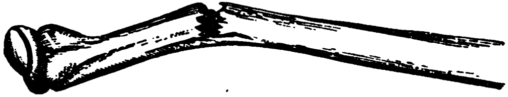
Various circumstances predispose to fracture. The situation and shape of the bone, the presence in it of organic disease, the age, sex, and constitution of the patient—these are all points which influence the liability to fracture.

Fractures are of various kinds. Sometimes they are *simple*—the bone is merely broken into two pieces. Sometimes they are *comminuted*—the bone is broken into several pieces. Sometimes they are *impacted*—the fragments are driven into one another. Sometimes they are *compound*—the fracture communicates with an open flesh wound. Sometimes they are *complicated*—the bone is not merely broken, but some large vessel or some internal organ is injured as well.

Again, fractures are named *transverse*, *longitudinal*, *oblique*, &c., according to the direction of the fissure.

Again, fractures are usually *complete*. Sometimes, however, they are *incomplete*—that is to say, the bone is partly bent, and partly broken. The *greenstick fracture*, which is occasionally met with in children, is the best example of an incomplete or partial fracture. Fig. 34 is taken from a preparation in Charing Cross Hospital Museum, and represents a greenstick fracture of the ulna in a boy, aged 14. The particulars of the case were related by Mr. Canton in the *Lancet* of January 8, 1859.

Fig. 34.



The special indications of fracture are *loss of power*, *alteration in shape*, *unnatural mobility*, and *crepitus* or grating. With these signs there is more or less pain and swelling. When all these symptoms are present, they prove that a fracture has taken place; but the surgeon must not expect to find them all equally well marked in every case.

As the distal part of the bone, to which the muscles are attached, has lost its support, the patient is unable to move it, unless it be indirectly. There is, therefore, more or less *loss of power.*

The *alteration in shape* is caused, either directly by the violence of the blow which produced the fracture, or by subsequent muscular action. In ascertaining the nature and extent of the displacement, accurate measurements should be made, first on one side, and then on the other, taking as landmarks some of the bony prominences—the acromion, the crest of the ilium, the trochanter major, &c. In studying the position of a fractured bone, the surgeon should bear in mind the attachments of the various muscles, and the effect which would naturally be produced by their contraction.

Though there is on the patient's part, as we have just seen, loss of power to move the limb, yet, if the surgeon grasps the injured bone, he finds that there is *unnatural mobility.* The broken fragments move freely upon one another.

But the most important and valuable sign of fracture is *crepitus* —the grating which is produced by rubbing the broken ends of the bones together. This grating may be both felt and heard. When present, it is an unmistakable indication of fracture. But a long bone may be broken, and yet there may be no crepitus, because the fragments are impacted. When the short or flat bones are broken, we are not so well able to avail ourselves of this aid to diagnosis.

UNION OF FRACTURES,

When the fragments of a broken bone are kept in apposition, union takes place by the deposition of new bone around and between them. Such new bone is called *callus.* That which is formed first, and which is generally very abundant, is termed *provisional callus.* While that which remains ultimately, after a good deal has undergone absorption, is termed the *definitive callus.*

When a *simple* fracture occurs, the injury itself sets up inflammation in the surrounding tissues, and this inflammation is of the adhesive kind. Plastic lymph is poured out, forming a thick and dense sheath—a sort of natural splint—around the broken fragments. Between the ends of the bones the same plastic material is effused, and the medullary canal is filled up and obliterated by it. Gradually the effused lymph becomes developed into bone. When it is first deposited, it has a finely granular appearance under the microscope; then cells are found in it; and, ultimately, it assumes all the characters of true bone. Sometimes it passes through the stage of fibrous tissue, cartilage, or fibro-cartilage. Although the bone is firmly united by the end of six weeks or two months, it is not reduced to its normal shape and size until after the lapse of a considerable time. The superfluous callus undergoes gradual absorption, a fibrous periosteum is formed, a medullary canal is established, and at length the bone returns almost entirely to its natural state.

The amount of provisional callus seems to depend upon the mobility of the fragments, and the depth of the soft tissues that cover them; in other words, upon the degree of irritation, and the extent of tissue, which is apt to become inflamed by it. When the broken bones are kept in accurate apposition, and when they are covered by little more than their own periosteum, the provisional callus is small in quantity. In impacted fractures there is but little; in cases of broken ribs, on the other hand, there is usually a great deal.

Union in compound fractures takes place somewhat differently. Here the inflammation which is excited by the injury is not of the adhesive, but of the suppurative kind. Pus is poured out. Granulations spring up around and between the fragments, and in these the osseous matter is deposited. The amount of new bone will be in proportion to the extent of the granulating surface. At the same time there is apt to be much constitutional disturbance, with a proneness to erysipelas, phlebitis, or pyæmia.

TREATMENT OF FRACTURES.

Simple fractures.—In treating simple fractures, we have to aim at—(1), reducing the fragments to their proper position; and (2), keeping them in such position, until nature has effected their union.

1. No time should be lost in reducing the fragments. The muscles soon become rigidly contracted, and then the difficulties of the case are greatly increased.

Sometimes there is so little displacement, that there is no need of reduction. All that is then wanted is to study the position of the limb, and to relax the muscles. But, in other cases, we have to employ both *extension* and *counter-extension.*

Extension is made by drawing upon the distal fragment; counter-extension by drawing upon the proximal fragment. In every case the force should be applied slowly, gradually, and continuously—without jerking or violence. Chloroform is of great value, by enabling us to overcome muscular rigidity and spasm.

2. When the fragments have been reduced, our next care is to keep them in position. Here again it is of great importance to

maintain the studied position of the limb, so that no displacement may occur from muscular contraction. But in most cases something more than this will be requisite—*bandages, splints,* or *mechanical appliances.*

Some fractures—fracture of the clavicle, for example—may be treated by bandages alone. But in the majority of fractures, a splint of some kind will be necessary.

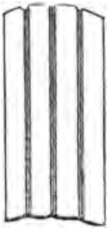
Originally, no doubt, splints were straight pieces of wood—*splits or splinters*—and wooden splints are still by far the most commonly used; but from time to time splints of various materials and forms have been introduced, so that now the surgeon can make his choice among a number of appliances, and select that which is best suited to his purpose.

Wooden splints are clean, light, and cheap, and hence they are particularly suitable for our purposes. Moreover, they can be obtained everywhere. A village carpenter can easily make all the ordinary splints; and even the surgeon himself, if he is furnished with a half-inch board, a saw, and a knife, ought to be able to supply the patient with an apparatus which will answer the purpose. We may take this opportunity of saying that if the surgeon is an ingenious man he will seldom have any difficulty in finding materials to form a temporary appliance; a little reflection will soon suggest something which will accomplish the object that he has in view. For example, a bundle of straw, a folded newspaper, the board of a book, and many other things have been used on an emergency.

The variety of wooden splints is great, because they may be made to serve nearly all tbe purposes for which such appliances are called into use. Some are straight; others are bent at a right angle. Some are flat; others are concave, or cut out so as to fit the part for which they are intended. Some are made of a single piece of wood, others are furnished with hinges. Indeed, their variety is almost endless, and when a student first goes into the splint-room of his hospital he will be amazed at their number; but a short experience will soon teach him the use of each.

One of the most useful kinds of wooden splint is what is known as the *common lined splint,* and which may be obtained at any surgical instrument maker's (Fig. 35). It consists of a thin board fastened upon a piece of leather or canvas, which accurately fits the size of the splint. The wood is then cut lengthwise with a number of parallel incisions, which penetrate nearly, though not quite, to the leather or canvas,

Fig. 35.



so as to leave a series of narrow strips of wood held closely together by the material upon which they are secured. A slight degree of force suffices to separate the pieces of wood entirely from one another, so that a hinge is formed between each pair, and thus the splint is capable of being made concave throughout its whole length. Moreover, these splints have other advantages. They can be used as flat splints by simply turning the wooden side towards the limb; and the surgeon will find that by keeping a few common lined splints at hand he is furnished with materials which he can easily cut down with a penknife so as to form small splints for fingers, &c.

Another variety of splints which is in constant use is that which is made of metal—either of japanned iron or of tin. These splints have special advantages. They are thin and do not take up much space; they can be made of any shape; they can be fitted with hinges or screws more efficiently than wooden ones, and they can be kept cleaner, as they do not allow the discharges to soak into them. As a rule these metal splints are made for special cases, and for particular parts. It is to complicated cases—cases requiring special mechanism—that they are the most applicable. Thus, those which are commonly used for excisions of the elbow and knee are made of japanned iron, because the peculiar form of apparatus which is needed for these cases can be made more efficiently in that material than in wood. Again, as an example of the simplest form of metal splints we may mention those which are generally used for cases of club-foot in infants. They consist of a flat piece of tin, of suitable length and breadth, rounded at the corners and perforated with a series of small holes near the edge, to which a pad can be attached. These splints have the advantage of being very cheap, and clean, and light; at the same time the surgeon can bend them to any angle that the circumstances of the case may require, so that they may be made to serve all the purposes of a more complicated and expensive apparatus.

As a general rule, splints are applied next the skin. They should therefore be well padded with tow or cotton-wool. Those splints which are closely moulded to the form of the part will not require padding, except under peculiar circumstances.

The splint is to be fixed by means of bandages firmly and evenly applied, but not so tight as to impede the circulation.

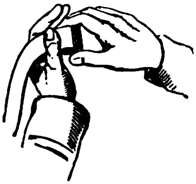
Bandages or rollers, as they are sometimes called, are of several different kinds. Those which are most commonly used are made of unbleached cotton or calico. Others are composed of a woven cotton fabric, and pass under the name of elastic cotton or stocking bandages. Others are made of flannel—a thin, open flannel, which is known as "Domett" or "Welsh flannel gauze." Sometimes a coarse muslin roller is required, as in the application of a plaster of Paris bandage.

These different kinds of bandages have each their special advantages, and are preferred in certain situations, or for particular purposes.

Bandages are classed under three heads according to their length and breadth; and are spoken of as *arm-bandages, leg-bandages,* and *rib-bandages.* But each of these is suitable for other purposes besides those which its name indicates.

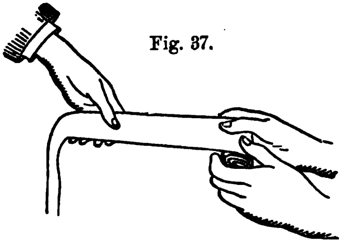
An arm-bandage should be about two inches wide by eight yards long, a leg-bandage two and a half inches wide by ten yards long and a rib-bandage five inches wide by twelve yards long. These are the dimensions in which they are usually cut, and which will be found most generally useful in practice; but, of course, they may be made broader or narrower, longer or shorter, according to the purpose for which they are intended, and the situation to which they are to be applied. It is always well that they should be cut off as soon as their object has been attained; there is no advantage in making more turns than are necessary.

Fig. 36.



All bandages should be rolled into a firm, even, and compact mass. This may be done perfectly well with the hand; but sometimes a simple machine is used for the purpose. The machine consists of a small wooden box without a lid, traversed from side to side by a rolling-pin, which is moved by a crank attached to it. The whole is not unlike a miniature barrel organ. The end of the bandage is introduced through a slit at the extremity of the box, and fastened to the rolling-pin. The handle is then turned until the whole length of the bandage has been rolled; the rolling-pin is then withdrawn; and the bandage, ready for use, remains in the box. This machine has been variously modified; but the form we have described is perhaps the simplest in use.

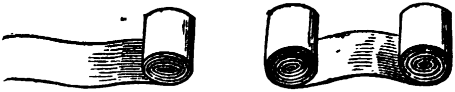
Fig. 37.



One method of rolling bandages with the hand is represented in the annexed woodcut (Fig. 36), but it is a plan which is only suitable to narrow bandages. Another method, which is applicable to all bandages alike, is shown in Fig. 37. But this requires the assistance of a second person to hold the bandage out and make it tight.

When a bandage is rolled from one end only, it is called a single-headed bandage; but when it is rolled from both ends it is spoken of as a double-headed bandage (Fig. 38).

Fig. 38.



For all ordinary purposes, both in private and in hospital practice, there is nothing so generally useful as the common calico or unbleached cotton bandage. It is cheap, it is strong, and it is clean. It is admirably adapted for fixing splints, for retaining dressings, or for keeping parts at rest. It ought to be of a sufficiently good quality to tear with a clean edge, and to be firm and unyielding.

Sometimes, however, we desire a bandage which shall contract a little upon the part to which it is applied, so as to keep up a slight degree of pressure or afford a little support; and then we have recourse to an elastic cotton or to a flannel bandage. Either of these may be very appropriately applied to an œdematous limb, to support varicose veins, or to promote absorption of the thickening and effusion that are frequently left after fractures or other injuries. A flannel bandage has some special advantages. It is capable of absorbing moisture, it retains warmth, and its surfaces adhere to one another, so that it keeps its place better than any other kind of roller.

As far as possible the bandage ought to be made of one continuous piece, without any joinings; and the selvages ought always to be torn off. In a word, the surfaces and edges of the bandage should be as smooth and even as they can be made. There should be nothing which can press unequally upon the part, or constrict it, or irritate it in any way.

In applying a bandage it is necessary to secure the end of the roller, and to get a point upon which we can make traction. Thus we often take a turn round the thigh or arm for no other reason than to fix the commencement of the bandage.

If possible, the seat of fracture should be left uncovered, so that it may be observed from day to day, and locally treated, without undoing the bandages.

Every fracture is attended with more or less inflammation. Sometimes this runs so high as to give rise to abscess. When this happens, the bandages must be undone, the matter evacuated, and the case treated as one of compound fracture.

If blood has been extravasated, its absorption may be promoted by a spirituous lotion (F. 18). An incision should never be made for the purpose of letting it out.

All fractures are apt to be followed by slight œdema from inflammatory effusion or extravasation. But if the swelling is so great that the pressure of the splints and bandages interferes seriously with the circulation—if the extremities become cold and blue—then the bandages must be loosened at once, and every care taken to prevent gangrene.

If erysipelas, traumatic delirium, tetanus, &c., follow fracture, they must be promptly treated; but without interfering with the special apparatus more than is necessary.

The use of waxed bandages in the treatment of fractures is as old as the time of Hippocrates (Syd. Soc. Translation, i. 21), but of late years such applications have come much more into vogue than formerly; and the use which is now made of bandages stiffened with solutions of starch, dextrine, or other substances, is one of the many improvements which has taken place in modern surgery. Such bandages are particularly suitable to the treatment of fractures. They form a light, firm, closely-fitting appliance, well adapted to keep the ends of a broken bone in position. By this means we are sometimes enabled to allow a patient to leave his bed in a few days after he has met with a fracture of the leg, or even of the thigh, and to go about on crutches during the time that union is taking place.

The starch bandage is made in the following manner:—The starch is mixed with water until it forms a thick paste, and if a little spirit is added it will dry more quickly. A cotton roller is then moistened with the paste; and in doing this it will be found convenient if an assistant rolls up the bandage as the surgeon unrolls it, and saturates it with the starch-paste. The surgeon should keep the basin of paste at hand while he is applying the bandage, as well as rollers, lint, paste-board, and everything else that he may require; for when its application is once begun, it ought to be completed without delay and without interruption.

Having made these preparations, the surgeon first of all lays a piece of broad tape along the whole length of the surface to which the bandage is to be applied. The object of this will be explained immediately. He then takes a narrow flannel roller and binds it upon the part, in the usual manner, in order to protect the skin. If he is dealing with the leg, it may be well to cover the heel, so as to prevent the starch when it dries from injuring the skin; and, as this is a difficult matter, a few stitches may sometimes be required to keep the roller in its place; for it is important that it should not slip when the starch bandage is applied over it. The flannel roller should form a thick and complete protection to the part; and any hollows which may exist should be filled up with a little cotton-wool or other soft material.

The bandage, which has previously been moistened with starch-paste, should now be applied in the same way as an ordinary roller. The whole surface ought to be covered with at least two layers of bandage; and if, after this has been done, there are any parts which appear weak, they should be strengthened by short strips of bandage or lint in order to give the necessary support.

Some surgeons prefer to envelope the part in a layer of cotton-wool, instead of in a flannel roller.

When the starch bandage is applied for fracture, it is a good plan to lay strips of pasteboard along the sides of the limb over the flannel roller or cotton-wool, so as to fix the joints above and below the seat of injury.

Sometimes, instead of a roller, short strips of bandage moistened with the starch-paste are folded round the part in regular order. Sometimes the roller is applied dry, and the paste is rubbed into it by an assistant as each fold is laid down. This is a neater and cleaner method than the one which we have described at length, but it does not make such an efficient bandage.

Bandages of this sort may be made of various other substances besides starch. Of these we may mention *dextrine*, *white of egg and flour*, and *powdered gum*, or *precipitated chalk*. We have spoken of starch because it is the cheapest of all, and because it is to be found in every household. But whatever substance we select as the basis of our paste the principle of application is the same in all cases. Our object is to moisten the bandage with a solution which will not interfere with the pliability of the roller, but which, as it dries, will harden and form a firm covering for the affected part.

When a starch bandage has been applied, eight or ten hours, or perhaps even a longer time will have to elapse before it becomes dry and hard. During the time that it is drying, it may be convenient to lay paper under the part, in order to protect the bed-sheets; care being taken that the limb is in proper position.

When the bandage has become thoroughly dry, it will generally be found to be rather loose. If this is the case it should be slit up throughout its whole length with a strong pair of scissors, or with an instrument sold for the purpose, under the name of "Seutin's pliers." It is with a view to facilitating this operation that we have recommended that a piece of tape should be laid next the skin, as the first step in the application of the bandage. By this simple expedient we are enabled to raise the bandage, and to slit it up with less pain and risk to the patient than if we had to push the point of the scissors between it and the skin. After the bandage has been slit up, it may be reapplied by the addition of a common cotton roller on the outside. In this way a light case is formed which fits the limb accurately, but which can be easily removed, so as to observe the exact condition of the part.

If there is any sore—for example, the wound of a compound fracture—a sort of small door may be cut in the starch bandage, so as to admit of the wound being dressed without disturbing the general arrangement.

Paraffo-stearine bandages were introduced to the notice of the profession by the late Mr. Startin.* They consist of rollers saturated with a waxy composition, which readily melts sufficiently to admit of its application to the part, and then quickly hardens.

These bandages are said to have the advantage of being convenient and cleanly, and easy of application; moreover they adapt themselves with great exactness to the shape of the part, so that they would seem to be particularly suitable for cases in which the surgeon wishes to give even and continuous support, as in varicose veins and ulcers of the leg.

A plaster of Paris or *gypsum* (Gr. γύψος, chalk) *splint* is made in the following manner:—

The surgeon takes a coarse muslin roller, and into the meshes of this he dusts the dry, powdered plaster of Paris. A stock of bandages prepared in this way may be kept rolled up and ready for use. When the surgeon is about to apply one he ought to have at hand a bag of the dry plaster and a basin of water. He then proceeds to cover the limb, which has to be bandaged, with a flannel roller, or to envelope it in a layer of cotton-wool. After this he takes the roller, which has been previously prepared, and soaks it in water, or pours water upon the ends of the roll until the whole is moistened. He then applies it as he would an ordinary bandage. As each fold is laid down it may be necessary to sprinkle it with water, or to dust it with the dry powdered plaster, in order to strengthen the application. After a sufficient amount of bandage has been applied in this way the outside ought to be smeared with a thick paste made by mixing some of the plaster with water. This external layer ought to be as smooth as possible, not only to give the splint a finished appearance, but also that there may be no irregularities which might catch upon the bedclothes, or upon the patient's dress. In a few minutes the plaster of Paris "sets," and forms a firm, hard splint. Care must be taken to keep the limb in its proper position until this has taken place.

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* They are made by Mr. Ewen, of Jermyn-street.

Some surgeons prefer to apply this splint in the form of short strips of bandage, moistened with the plaster of Paris paste, and folded round the part until a sufficient thickness has been attained.

Plaster of Paris has some disadvantages as compared with starch or dextrine. It is more bulky, heavier, and less easy to cut; so that if the splint is found to fit badly, or if the limb shrinks away from it, it cannot be slit up and readjusted without a good deal of difficulty. On the other hand, it has peculiar advantages. It "sets" quickly, it forms a hard and unyielding case, and the patient cannot remove it himself, as he can the starch bandage; and this is sometimes a point of importance, especially in dealing with children.

Gutta-percha splints are made in the following way:—

First of all a shape must be taken of the part to which the splint is to be applied. This may be done with paper; or, better still, with a piece of damp calico. When an accurate pattern has been obtained, the surgeon cuts a piece of gutta-percha of the same shape and dimensions. This he dips in boiling water, taking care that the dish which he uses is of sufficient size to contain the gutta-percha without folding it upon itself. For large splints a flat tin bath serves the purpose admirably, while for smaller ones an old tea-tray or a foot-pan may be conveniently used. The gutta-percha soon softens under the influence of heat; and when it has become quite plastic the surgeon takes it out of the water, dries it quickly, and then lays it upon the part for which it is intended. In order to prevent the heat from being painful to the patient the calico shape may be placed next the skin, and the gutta-percha laid upon it. The gutta-percha ought then to be rapidly moulded on the part, and a roller applied over it. By this means it adapts itself closely to the surface. After it has cooled it may be removed; and it will then be found to have taken the required shape. The edges should now be pared, and the corners rounded off; after which the splint should be lined with wash-leather, the leather being turned over the edges, and continued for a short distance on the outside. It is a good plan to punch holes of variable sizes in the splint, so as to allow a free circulation of air; otherwise it is apt to become inconveniently hot and irksome to the patient when it has to be worn for any length of time. (See Figs. 44 and 46.)

Splints made of sole leather, or of what is sold under the name of "Spark's leather," or of millboard, may be formed in the same way as the gutta-percha ones which we have just described.

Complicated fractures.—A simple fracture may be complicated by laceration of the main artery. When this occurs, a diffuse, semi-elastic tumour rapidly forms. At the same time the pulsation ceases in the arteries on the distal side of the swelling. What is to be done in such a case? A tourniquet should be at once applied to the main artery in the upper part of its course. If this arrests the bleeding, the pressure may be continued, and the absorption of the extravasated blood promoted. If, however, this fails, a ligature may be put round the main artery above the seat of injury—provided always that the circulation has been restored on the distal side of the swelling. Or the tumour may be laid open, and the ends of the artery tied; but this practice is of very doubtful expediency. Or, lastly, amputation may be performed.

Sometimes a fracture is complicated with a wound which does not communicate with the broken ends of the bone. In such a case the treatment must be modified, and the surgeon will have to arrange his appliances in such a way, that the wound may be dressed without disturbing the position of the fragments.

Compound fractures.—The wound which communicates with the fracture may be the result of direct violence at the time of injury, or of a sharp fragment of bone having been subsequently driven through the skin by muscular action, or it may be caused at a still later date by sloughing of the soft tissues.

Compound fractures must be "set" in much the same way as simple ones, only more solid splints, such as McIntyre's, or the fracture box, will often be found necessary. Here, however, it is absolutely essential that the seat of injury should be left uncovered by bandages. If one of the fragments protrudes, and there is difficulty in reducing it, a piece may be cut off with Hey's saw or with bone-pliers.

Everything should be done by an elevated posture, perfect rest, the continuous application of cold, or of an antiseptic dressing, to anticipate and prevent inflammation.

When the wound is but small, it should be covered with a pledget of lint soaked in collodion, in Friar's balsam, or even in the exuding blood. Beneath this artificial scab the opening may heal, and the bone unite, as in the case of a simple fracture.

If suppuration is once established, we must be contented with union by granulation. A free vent must be given to the pus, and the wound treated on general principles—either by strictly antiseptic dressing, as recommended by Lister; or by poultices, water-dressing, astringent or stimulating lotions, &c. The amount of suppuration, and the time that the bones take to unite, will depend chiefly upon the extent of the wound, the quantity of tissue destroyed, and the constitution of the patient.

In all the more severe cases of compound fracture in the extremities the question of amputation will arise. Such amputation may be either primary or secondary.

Primary amputation—amputation within twenty-four hours—may be required when the bone is much splintered and comminuted, when the soft tissues are extensively disorganized, when the main vessels are torn, or when a large joint is freely opened.

These are some of the circumstances which the surgeon should take into account, in determining whether a primary amputation should be performed or not. At the same time the age, constitution, and habits of the patient are points of great importance, and must not be overlooked in forming an opinion.

Secondary amputation—amputation after active inflammation has subsided—may be required on account of gangrene, extensive necrosis, non-union, &c.

Sometimes when a broken bone is not treated at all, or has been badly treated, and deformity results, it may be necessary to break it afresh, in order to put it in proper position.

UNUNITED FRACTURES AND FALSE JOINTS.

Bony union may fail to take place from a want of perfect apposition and of rest, from an insufficient supply of blood to the fragments, from excessive suppuration and necrosis, or from defects in the general health and condition of the patient. In the first two cases a fibrous or ligamentous union takes place—a false joint is formed. In the other two cases, it not unfrequently happens that there is no union at all. Either no callus is thrown out, or else it is wholly absorbed without becoming ossified.

Treatment.—If the non-union depends upon constitutional causes, we must do what we can to improve the general health of the patient, at the same time that we adopt suitable local measures.

If it depends upon an insufficient supply of blood, there is but little hope of a remedy. In a suitable case, some of the measures which will be mentioned immediately, should be tried. Generally, however, we must be contented with fibrous union, and endeavour by means of a special splint, or other apparatus, to mitigate the inconvenience arising from the broken bone.

If it depends upon a want of proper apposition and of rest, the first and mildest measure is to put up the fracture firmly in starch bandages, and to keep it so fixed for a considerable time. If this fails, various means of exciting inflammation may be tried. The ends of the bones may be roughly rubbed together; or a seton may be passed through the false joint; or the ligamentous union may be subcutaneously divided with a knife. If these means do not succeed, we may cut down upon the false joint, saw off the ends of the bones, and treat the case as one of compound fracture. If need be, the inflammatory action may be increased by inserting ivory pegs into the ends of the bones. As a last resource amputation may have to be performed.

FRACTURES OF THE SKULL

always arise from external violence. They may be either simple or compound.

The skull may be fissured at the seat of injury, or by *contrecoup*, the force being applied at one part of the skull, and producing its effects upon a distant and more fragile part. In either of these cases, the fissure may traverse the outer table alone, or the inner table alone, or both together. Or again, the skull may be punctured by a sharp-pointed instrument, causing a starred fracture. Or again, it may be broken into fragments and comminuted, with or without depression.

The dangers which attend these injuries are—1, concussion; 2, compression; 3, hæmorrhage within the cranium; 4, inflammation of the brain or its membranes. (See p. 192.)

When union takes place in fracture of the skull, it is by definitive callus. There being but a thin covering of soft tissue, and little or no movement of the fragments, the provisional callus which is formed is very small in quantity.

Simple fissures vary greatly in their extent. They may be very short, or they may traverse the entire circle of the cranium.

Symptoms.—There is always more or less concussion. After a time there may be signs of compression from internal hæmorrhage; and this may be followed by symptoms of inflammation of the membranes, or of the substance of the brain.

The aim of *treatment* is to remove any causes of compression, and to anticipate and prevent inflammation. As soon as the patient begins to rally from the shock of the injury, his head should be shaved, and ice, or cold lotions continuously applied (F. 18, 20). His bowels should be freely opened. His diet should be of the most unstimulating kind, and perfect quietness and rest should be enforced. Some surgeons recommend that blood should be freely taken from the arm. But this is rarely necessary, and should not be thought of unless the patient is of a full habit of body.

Fracture of the base of the skull is an accident of frequent occurrence and most serious import. The danger is lest the brain should be lacerated, or one of the large arteries or venous canals torn across.

The special signs are bleeding into the orbit, or from the nose or ears, and the discharge of serous fluid from the ears or nose.

The bleeding may be superficial, and, if so, is unimportant. If, however, it comes from within the cranium, it is a very alarming symptom.

The serous fluid, which is sometimes discharged from the ears or nose, seems to be derived from the cerebro-spinal fluid. Its escape proves a rupture of the arachnoid. The fluid itself consists chiefly of water with some common salt, a little albumen, and a trace of sugar.

There is very little to be done in the way of *treatment.* All that we can do is to try and prevent inflammation on the plan already laid down.

Fracture of the skull with depression may occur without producing any serious consequences. In such cases the outer table alone is depressed; the inner is left uninjured. Generally, however, the inner table is more broken and depressed than the outer one. This is particularly apt to be the case in gunshot and punctured wounds of the skull. Sometimes, in children, the whole thickness of the skull is depressed without any ill effects.

Depressed fractures may be either simple or compound. When simple, the depression may be masked by extravasation of blood. When compound, the depression may be felt with the finger.

The special dangers, in cases of depressed or comminuted fractures of the cranium, are compression of the brain and inflammation of its membranes. The latter is far more likely to prove fatal than the former. The *dura mater* is easily inflamed, and the inflammation rapidly extends to the brain.

Treatment.—If there is a simple fracture with depression, unaccompanied by any symptoms of compression, the patient should be carefully watched, but no operation should be undertaken. Under such circumstances, it is better not to convert the simple fracture into a compound one. If, however, symptoms of compression come on, a crucial incision should be made without delay over the seat of injury, in order that any fragments of bone that are loose may be removed, and any portions that are depressed may be elevated.

If the wound is compound, it should be explored with the finger, and the fragments taken away, or the depressions elevated, as in the foregoing case.

The depressed bone may be raised, by introducing an elevator underneath it, and using the handle as a lever. Or it may be removed with Hey's saw, or with bone-pliers. Or, lastly, a circular piece may be cut out with the trephine.

It is surprising how much the brain may be injured without a fatal result. I have elsewhere related the case of a boy who received a compound comminuted fracture of the skull, with laceration of the brain and loss of brain substance, and yet recovered, so that he could return to his work and earn the same wages as other boys of his age. (Path. Soc. Trans. xxi.) Subsequently, however, he became imbecile; and I suspect that some such result happens in all these cases, after the lapse of a longer or shorter time.

FRACTURES OF THE BONES OF THE FACE.

The nasal bones.—These bones are not unfrequently broken by direct violence. The bridge of the nose is depressed, and the whole organ looks flat and broad. Such injuries are accompanied by a great deal of swelling and ecchymosis; and until this has been subdued the exact state of the bones cannot be ascertained.

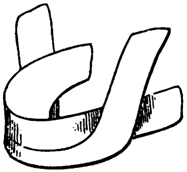
Treatment.—The depressed bones should be elevated by a director, forceps, or other suitable instrument, and retained in their proper position by a small roll of lint introduced into the nostril, while strips of plaster are placed outside.

The lower jaw.—Fracture of this bone only occurs as the result of direct violence. Frequently it is due to gunshot injury. It may be simple, compound, or comminuted. It may take place anywhere, but its most frequent seat is at the base of the bone, near the bicuspid teeth.

The diagnosis is generally easy. The mental portion is depressed, while the ramus is drawn upwards or inwards. Crepitus is distinct. The point of fracture can be felt. The gums are lacerated. The saliva dribbles from the half-open mouth.

Treatment.—Teeth which are only loosened should be left, and secured in their places by silver wire. Teeth or fragments of bone that are wholly detached had better be removed. When the fragments have been restored to their proper places and the teeth brought into line, the jaw should be fixed in that position by a pasteboard or gutta-percha splint. Such a splint may be made in the following manner:—A piece of pasteboard or gutta-percha about eight inches long by four broad is taken and split up the middle from each end to within an inch of the centre. The material should next be dipped in hot water, so as to make it soft and pliable, and the lower limbs folded upon the upper in the way indicated in Fig. 39. The splint should then be applied to the chin, and carefully moulded to the jaw. By a little manipulation, and by paring the edges, it may be made to adapt itself closely to the part, and to give it equal and uniform support. It then only remains to pad it, and it is ready for use. It should be retained in its place by a *four-tailed bandage for the chin*, which is made in much the same way as the four-tailed bandage for the head, only it is narrower. The surgeon takes a piece of calico about three inches broad and a yard or a yard and a half in length. In the middle line of this he cuts a slit large enough to receive the point of the chin; and it adds greatly to the comfort of the patient if the slit is made about an inch from one side of the bandage, so that, when it is applied, and the narrower portion is placed upwards, it may not rise so high as to cover the lower lip or the mouth. The bandage is then torn down from each end to within a couple of inches of the slit for the chin, so as to make four tails. When it is applied, the point of the chin is placed in the slit—the narrower side being upwards. The two upper tails are then carried horizontally backwards, and tied at the nape of the neck, or crossed and brought round in front; after which the two lower ones are conducted upwards, and fastened on the top of the head. It is a good plan in applying such bandages as this to leave the ends of the two knots sufficiently long to enable the surgeon to tie them together, so as to prevent them from slipping. Or the bandage may be retained in its place by means of a few circular turns made with another roller round the head, and secured with pins.

Fig. 39.



Splint for lower jaw.

This is a very useful bandage in cases of fracture of the lower jaw, or to retain poultices or dressings upon the chin.

FRACTURES OF THE RIBS.

The ribs are liable to be broken by blows or falls, or by a crushing weight passing over the chest or back. It not unfrequently happens that several ribs are broken at once.

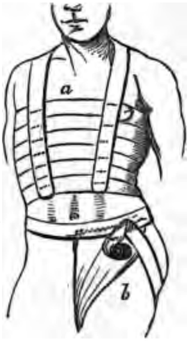
When the injury results from direct violence any part of the bone may be broken, but when it is caused by compression the fracture is generally situated at or near the angle.

The symptoms are sharp local pain, which is aggravated by drawing a long breath, and great tenderness on pressure. Crepitus may sometimes be felt or heard, and a depression detected in the outline of the bone.

The chief dangers are lest the pleura and lung should be wounded, giving rise to pleurisy, pneumonia, or surgical emphysema; or lest the case should be complicated by laceration or rupture of the liver, spleen, or other of the abdominal viscera.

Treatment.—When the injury is confined to one side the broken ribs should be supported with broad strips of adhesive plaster passing half round the chest. In this way they are kept at rest, while the respiratory movements of the sound side are not interfered with. But when ribs on both sides are broken a broad roller should be applied in circular turns round the chest, beginning from below and gradually ascending—each fold overlapping about a third of the preceding one. The bandage should be drawn sufficiently tight to give a firm and even support to the whole chest. In order to retain it in its place a separate strip of calico should be passed round the neck, in the form of a brace, with the ends coming down in front as low as the bandage extends. These ends ought then to be pinned—or better still, stitched—to the circular turns, and the circular turns ought to be stitched to one another, so as to make the whole into a firm bandage, which will keep its place for some time (Fig. 40, *a*). In hospital practice a calico bandage is generally used, and answers the purpose sufficiently well; but a flannel one is better, for it both gives more support by exercising a slight degree of compression, and it also retains its place for a longer time without requiring to be reapplied.

Fig. 40.



(*a*) Rib-bandage.

Instead of this roller for the chest some surgeons prefer to use a lacing body-bandage; others a single broad binder of flannel; while others again employ a simple belt of adhesive plaster, about a foot broad and long enough to go once and a half round the chest. The latter is a particularly suitable application for children. Whatever appliance is used it should be kept on for a fortnight or three weeks at least.

FRACTURES OF THE CLAVICLE.

The clavicle is very often broken, partly on account of its exposed position, and partly because it forms one of the bearing points of the upper extremity.

The fracture generally occurs about the middle of the bone, but sometimes it is near the acromial end.

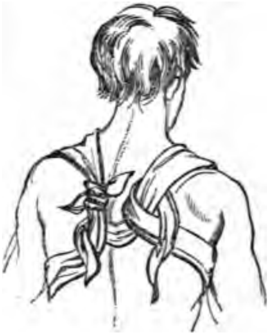
When the seat of fracture is near the acromial end, the signs are not well marked, but when it is about the middle there is a displacement which is very characteristic. The outer fragment is drawn downwards and inwards. This is owing partly to the weight of the arm, and partly to the action of the pectoralis minor and subclavius muscles.

Treatment.—When the clavicle is broken near its acromial end, all that is needed is to put a figure-of-8 bandage, or a "compound axillary bandage" round the shoulders, and to support the elbow and fore-arm in a sling. In this way the point of the shoulder is raised and drawn outwards and backwards, and these are the two leading indications in treating a fracture in this situation.

The compound axillary bandage is a ready and efficient means of drawing back the shoulders, and may often be of use, especially in cases of emergency.

It requires two common handkerchiefs, folded in the form of cravats, about three inches broad. One of these is passed round one shoulder and firmly knotted, so as to form a loose ring. The other is then thrown round the opposite shoulder and tied in a single knot. One tail is then looped through the ring formed by the first cravat, the necessary amount of tension is exerted, and the two tails are tightly fastened together. A glance at the woodcut will show how the bandage is adjusted. (Fig. 41.)

Fig. 41.



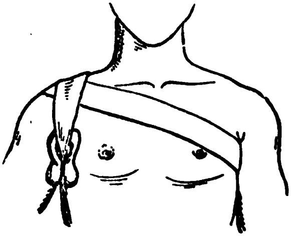
Compound axillary bandage.

When the fracture is situated, as it generally is, about the middle of the clavicle, something more than this will be necessary. There are then three points to which special attention ought to be paid:—the shoulder should be drawn back by a figure-of-8 bandage; the point of the shoulder kept out by a pad placed in the axilla; and the elbow and fore-arm well supported in a sling.

It is not always needful to carry out the first of these indications, for it frequently happens that the displacement is so slight that there is no over-riding of the fragments, and then there is no occasion to draw back the shoulders, and we are able to dispense altogether with the figure-of-8 bandage.

The axillary pad should be somewhat wedge-shaped, the thick end being placed upwards. It ought to be broad enough to keep the shoulder out to its full extent, and long enough, from before backwards, to project a little both before and behind the axilla. It may be made of folds of lint, or of a cushion stuffed with bran, cotton-wool, tow, or horsehair. On an emergency a towel or a stocking may be rolled so as to serve the purpose sufficiently well. For an adult the pad ought to be from two to two and a half inches thick, and five or six inches from before backwards. In some cases it may be necessary, in order to keep it in its place, to tie it over the shoulder with tapes or a bandage. (Fig. 42.)

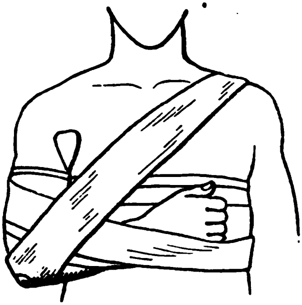
Fig. 42.



Fracture of the clavicle (1).

In rare instances it may suffice, after placing a pad in the axilla, to support the arm in a sling, without the application of any bandage; and in such cases the sling ought to be so adjusted as to make pressure upon the elbow, drawing it inwards across the chest, and at the same time pushing it slightly upwards. In this way the humerus is used as a lever to raise the point of the shoulder, and to keep it out. But in the great majority of cases the arm will not be kept sufficiently still by means of a sling only; to obtain greater security we have recourse to bandages. These are often applied in the manner recommended by Desault, and the arrangement bears his name. The surgeon takes an arm bandage, and makes two or three turns round the chest so as to fix the end. He then passes the roller round the arm of the affected side in such a way as to fasten it to the chest, and draw it well forward, and support the fore-arm. When this has been done he takes a second bandage, and binds it in ovals round the elbow, across the chest, and over the opposite shoulder; and finishes off with three or four circular turns round the chest to fix the whole, and keep it in position.

Fig. 43.



Fracture of the clavicle (2).

The accompanying illustration (Fig. 43) represents a simpler method. Here the numerous oval turns are dispensed with, and their place is supplied by a single fold with a hole cut in it to receive the elbow.

When the bandage is adjusted it ought to be pinned, or stitched, here and there, so as to keep it in place, for it is very apt to shift, and it is desirable that it should not be moved oftener than is absolutely necessary.

In infants and young children a fractured clavicle may be conveniently put up with two or three strips of plaster, each about a couple of inches broad. If necessary the shoulders must be drawn back by a figure-of-8 bandage, a pad must be placed in the axilla, and then a strip of plaster passed round the arm, so as to bring it well forward, and fix it upon the chest—the ends of the plaster being made to adhere to the chest and back. A second strip of plaster is then to be passed round the fore-arm to support the elbow, and brought up before and behind, and attached, like the other, to the back and chest.

By attending to these directions it will generally be easy to bring the fragments of the broken bone into apposition, though it often requires constant attention to keep them in their proper place. It will usually be necessary to continue the use of the appliances for five or six weeks.

FRACTURES OF THE SCAPULA.

The body of the scapula may be broken in any situation, but as this accident can only occur as the result of great and direct violence, it is usually associated with severe injuries to the ribs or spine.

In some very rare instances the neck of the scapula has been broken. This accident is so uncommon that some surgeons have doubted whether it ever occurs at all. There can, however, be no question about it. If other evidence were wanting, a case which has been recorded by Spence in his "Surgery" (Pt. ii. p. 434), and which was verified by post-mortem examination, puts the matter beyond a doubt.

The acromion and the coracoid processes are occasionally broken off—the latter very rarely, the former more often. When the acromion is fractured the arm hangs useless by the side, the outline of the shoulder is flattened, the head of the humerus is slightly depressed, and an irregularity may be felt in the bone at the seat of injury.

The *treatment* consists in supporting the arm in a sling so as to bring the two fragments of the bone into line. The union is sometimes by bone, but more often by ligament.

FRACTURES OF THE HUMERUS

may be considered under three divisions—those of the upper extremity, those of the shaft, and those of the lower extremity.

It may be mentioned, once for all, that these fractures, when they occur in the neighbourhood of joints, are often attended with so much inflammation that it is necessary to keep the patient in bed for a week or ten days, and to use fomentations or cold lotions.

FRACTURES OF THE UPPER EXTREMITY OF THE HUMERUS.

This bone is occasionally, though very rarely, broken at the anatomical neck—*i.e.*, just within the line of insertion of the capsule. Such a fracture is of course intra-capsular. It may be either simple or impacted.

The signs of this injury are rather obscure. There is pain, swelling, loss of power, the outline of the upper end of the bone is irregular, and, if the fracture is impacted, there is a slight degree of shortening. If the fracture is simple there may also be crepitus.

Separation of the greater tuberosity.—It sometimes happens that the greater tuberosity is broken off, either by direct violence or by muscular action. In such a case the shaft and head of the bone are drawn upwards and inwards, while the greater tuberosity is carried upwards and outwards. By this displacement the breadth of the shoulder is increased to a remarkable degree, and the separation of the fragments is very distinct.

Fracture at the surgical neck—i.e., at that part of the bone which lies between the tubercles above, and the insertion of the latissimus dorsi and associated muscles below.

In this accident the upper fragment is turned upwards and outwards by the muscles which are inserted into the greater tuberosity, while the lower fragment is drawn upwards and inwards by the deltoid and the pectoralis major.

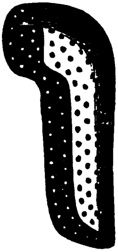
Signs.—The head of the bone is in its right place, but below it there is a depression. The lower fragment points beneath the skin in the direction of the coracoid process. The limb is shortened, and crepitus can easily be obtained.

Separation of the upper epiphysis.—In children the fracture not unfrequently happens at the line of junction between the epiphysis and the shaft of the bone. The signs of such an accident are much the same as the foregoing.

Treatment.—The fractures which occur about the shoulder-joint are extremely difficult to diagnose with accuracy; and although they have been described under four divisions for the sake of clearness, yet in practice it is by no means easy to determine the precise nature of the injury, and the surgeon must be prepared to vary his appliances according to the particular symptoms of the case, and the age and temperament of the patient.

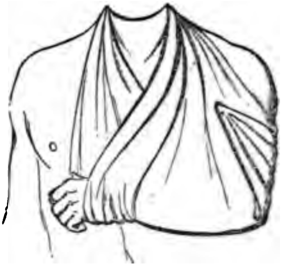
In treating the first two varieties of these fractures, the principal thing to be attended to is to keep the arm at rest, and to support it in the natural position. With this object, as soon as the acute symptoms have been subdued, it is usual to envelope the shoulder and upper-arm in a leather or gutta-percha cap (Fig. 44), and to place the fore-arm in a sling which shall support the elbow without pressing it upwards (Fig. 45). The shoulder-cap should be large enough to fix the parts thoroughly, and to keep them perfectly still.

Fig. 44.



Gutta-percha shoulder-cap.

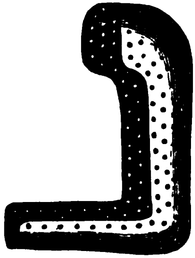
Fig. 45.



Sling for the elbow.

To do this it should extend from the middle of the clavicle nearly to the lower end of the humerus, and should be moulded upon the shoulder and arm in the way described in speaking of gutta-percha splints in general (p. 124). It is hardly necessary to say that such a shoulder-cap as this should be lined, and pierced with holes in the ordinary way. Some surgeons prefer to carry the gutta-percha or leather round the elbow, and to make a trough for the fore-arm, continuous with the cap for the shoulder and upper-arm. (Fig. 46.) But this is seldom required, and it always makes the apparatus more irksome to the patient. The gutta-percha splint should be secured by a light, cool bandage passing evenly round it throughout its whole length, or by ribbons placed at intervals, or by straps of webbing and buckles. The upper arm should then be bandaged to the chest, and the fore-arm comfortably supported in a sling. Sometimes it may be necessary to put a pad in the axilla, to assist in restoring the proper outline of the shoulder. But this is a point upon which the surgeon must use his own judgment.

Fig. 46.



Gutta-percha shoulder-cap with arm-piece.

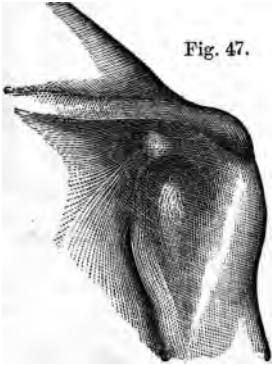
In almost all these cases, where there is apt to be pressure upon the axillary veins, either as the consequence of inflammation about the shoulder-joint, or because of the splints which it is necessary to apply, it is well to begin the treatment by bandaging the arm evenly from the hand to the fold of the axilla.

The last two of the four varieties of fracture which have been enumerated—viz., fracture through the surgical neck, and fracture through the epiphysis—generally present more displacement, and require accordingly other appliances. Here the object is not only to keep the parts perfectly at rest, but also to press the lower fragment outwards, for it has a tendency to be drawn upwards and inwards by muscular action.

Fig. 47 was drawn from a boy, aged fourteen, who had met with a fracture of the surgical neck of the humerus. He lived in a distant part of the country, far from medical assistance. No scientific treatment had been adopted, and the natural displacement had occurred. When he came to London for advice the fracture was firmly united, and the wasting of the muscles from disuse allowed the relative position of the bones to be seen with great distinctness.

To fulfil the indications mentioned above it is customary to put a splint on the outside of the arm, long enough to reach from the shoulder to the elbow, so as to fix the whole length of the humerus. A second shorter splint is then placed on the inner side of the arm, so as to push the lower fragment outwards, and keep it in its proper position; and in order to carry out this object more efficiently it may be necessary to apply a small pad over the point of fracture. The most suitable splints for these cases are the *common lined splints*. (See Fig. 35.) They should be well padded throughout, and the surgeon should see that there is additional padding above the condyles, so as to prevent any undue pressure upon those prominences. Care must also be taken that the upper end of the inner splint does not gall the fold of the axilla. The splints should be secured by bands of webbing encircling the limb, and fastened on the outer side by buckles. This mode of retaining the splints in their places has the advantage of being cool, and of enabling the surgeon easily to undo the apparatus, and examine the position of the broken bones.

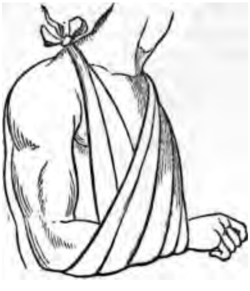
Fig. 47.



Fracture of humerus (untreated).

After the splints have been applied, the upper-arm should be fixed by a few turns of a bandage passing round the chest. The hand and wrist should then be supported in a sling, care being taken in this case not to include the elbow, but to allow it to hang down, so as by its weight to assist in counteracting the displacement upwards. (Fig. 48.)

Fig. 48.



Sling for the fore-arm.

Some surgeons recommend that these fractures should be treated by means of a splint placed on the outer side of the arm, and a pad in the axilla, to press the lower fragment outwards. Others, again, prefer a leather or gutta-percha shoulder-cap, such as we have already described, and a suitable pad under the arm.

FRACTURES OF THE SHAFT OF THE HUMERUS

may be either transverse or oblique. When oblique they commonly run from above downwards and outwards. There is great mobility, and crepitus can easily be produced. The displacement which occurs depends upon the precise seat of fracture. If it is above the insertion of the deltoid, the upper fragment is drawn inwards by the pectoralis major and associated muscles, while the lower fragment is drawn upwards and outwards by the deltoid. If the point of fracture is below the insertion of the deltoid, the lower fragment will be drawn inwards, while the upper portion of the bone is tilted outwards.

Treatment.—Fractures of the shaft of the humerus are generally treated by means of wooden splints. The "common lined splints" are the best; but if these are not at hand the ordinary straight ones will answer the purpose well enough. The arm should first be bandaged from the hand upwards, and then a splint should be placed on the outside, extending from the shoulder to the elbow. A second shorter splint should next be fitted upon the inner side of the arm, and, if need be, one or two smaller ones may be placed on the anterior and posterior aspects of the limb to counteract any special displacement that may be present.

The precise number of splints that are requisite must depend upon the circumstances of each individual case, and the surgeon must use his judgment upon this point. The size and circumference of the limb will generally determine how many are needed. When the arm is small, two will be enough to embrace it, but when it is fat or muscular, a third, or even a fourth; will have to be employed. After the splints have been adjusted the hand and wrist should be comfortably supported in a sling.

Some surgeons prefer to place a rectangular splint on the inner side of the arm. This is an excellent method of treatment, particularly in the case of children or irritable patients. Sometimes a starch bandage is applied to the upper-arm, especially when satisfactory union has not been obtained in the ordinary period.

FRACTURES OF THE LOWER EXTREMITY OF THE HUMERUS

may be considered in a group. The lower end of the humerus may be fractured transversely or obliquely above the condyles;

or either condyle may be broken off; or in children the lower epiphysis may be separated from the shaft of the bone.

In these cases the fracture is often comminuted or compound, and not unfrequently it is associated with dislocation. For these reasons, and on account of the rapid inflammation which sets in, it is often difficult to say what is the precise nature of the injury, but it is sufficiently evident that a fracture has taken place, and the treatment of all is much the same.

Treatment.—If there is much pain, heat, and swelling about the joint, we must have recourse to fomentations, cold lotions, leeches, &c., and the patient must be kept in bed, with the arm simply laid upon a pillow, until the inflammation has subsided. The arm should be bent to rather less than a right angle, so as to place it in the position that would be most useful to the patient in the event of anchylosis.

A rectangular splint should then be applied on the inner side, and fastened by straps of webbing and buckles, or by a bandage. The best kind of splint for these fractures is a concave one made of iron or perforated zinc, and jointed at the elbow, so that it can be set at any angle that may be necessary. Or two rectangular splints, made of wood, pasteboard, leather, or gutta-percha, may be applied, one on each side of the limb.

There is an advantage in applying a splint only on one side of the arm, for then the surgeon can easily watch the state of the part, and can use any local measures that may seem necessary to subdue the inflammation about the joint. Whatever splints are employed, great care should be taken that they do not press upon any of the bony prominences. With this view the padding should be increased in thickness above and below the condyles, so as to relieve them from the weight of the splint. After the apparatus has been adjusted the fore-arm must be supported in a sling.

If the fracture is compound, and the opening into the joint is but slight, an attempt may be made to save it by the continuous application of cold, or by antiseptic treatment; but if the joint is freely opened, excision—either primary or secondary—will have to be performed; and if the main vessels are torn, and the soft tissues extensively lacerated, amputation will have to be considered.

FRACTURES OF THE FORE-ARM.

The *olecranon* may be broken either by external violence or by muscular action. Sometimes the soft tissues are much bruised, or the fracture may be compound.

Treatment.—In simple fracture of the olecranon the arm should be kept extended by means of a straight splint on the anterior surface. The splint should be long enough to reach from the middle of the upper-arm to the middle of the fore-arm. It may be made of wood, or of tin, or even of millboard. Perhaps nothing is better than a "common lined splint" (see Fig. 35), or an ordinary straight wooden splint, bevelled off at the ends, so as to prevent it from galling the patient. But whatever kind of splint is used, it ought to be well padded. It need not, however, be burdensome to the patient, for its only object is to check the movements of the arm, and a very slight apparatus will be found sufficient for this purpose. Indeed, it is not necessary that the arm should be kept perfectly straight. This position is so irksome that a slight degree of flexion must be allowed. To meet this the pad should be graduated so as to be thicker in the centre, opposite the bend of the elbow, than at the ends. Some surgeons place a small pad on the back of the arm, just above the elbow, with a view of drawing down the upper fragment. The splint should be fastened near its upper and lower ends either by strips of adhesive plaster, or by tapes, or by pieces of webbing and buckles, or by a bandage. Here we may mention that, as a general rule, the lighter and cooler the method of fixing splints the more agreeable will it be to the feelings of the patient. The irritation which arises when the part is covered, and there is no escape for the perspiration, is almost intolerable, and it is of great importance to be able to undo the apparatus easily and wash the limb with soap and water. In the simpler cases of fractured olecranon the splint should be worn for about three weeks, and then the surgeon should begin to make passive movements, and to encourage the patient to use his arm by degrees.

When the soft tissues and the joint are much implicated, a considerable amount of inflammation will take place. The patient must be confined to bed, and the arm treated with fomentations, lotions, or leeches, before a splint can safely be applied. While this is being done the arm should be laid upon a pillow in the position which is easiest to the patient, and that will generally be a slight degree of flexion. After the inflammation has been subdued, a straight, well padded splint should be placed on the front of the arm, and the case treated as an uncomplicated one—only where there has been a high degree of inflammation the surgeon will have to use every effort to restore the movements of the joint. In some of the most severe cases, where there is great probability of anchylosis, it is the best plan to lay the arm upon an angular splint, fixed at a little less than a right angle.

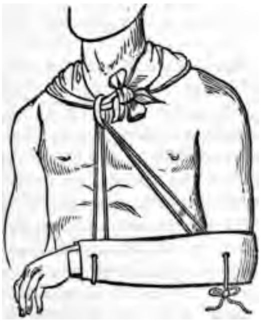
But after all our care, and when the immediate union is most satisfactory, we almost always find that the uniting medium yields to the movements of the arm, so that, in the course of time, an interval is established between the broken fragments. For this reason the surgeon will do well, for his own sake, to warn the patient at the outset that this is likely to occur.

In cases of compound fracture, with laceration of the soft parts, excision of the elbow-joint, or even amputation of the arm, may be necessary.

Fracture of the middle of the fore-arm.—Both bones may be broken, or only one. When both are broken, the displacement and crepitus make the diagnosis easy. When only one bone is broken, it may be more difficult to determine the exact nature of the injury. The fracture may be either simple or compound; in this locality the latter generally do well.

Treatment.—Fractures about the middle of the fore-arm, whether of one or both bones, are treated by placing the arm in the mid-position between pronation and supination, and fixing a straight splint on each side. The splints should be a little broader than the arm, so as to prevent the injured parts from being pushed together by the bandage, and long enough to extend from the elbow to the palm, so that they may support the whole length of the broken bones. Care should be taken to maintain the interosseous space by means of a narrow pad laid along the arm before the splints are applied. Such a pad may be formed of a few folds of lint, or the ordinary padding of the splint may be made a little thicker in the central line. The splints should be fixed by an "arm bandage" carried round them in simple circular turns, or in "reverses," or in a figure-of-8. Any of these modes of applying the roller may be used, and the one which is found to adapt itself most evenly to the splints will be the best. After the arm has been put up in the way that we have described, it should be carried in a sling which will support the whole length of the fore-arm and hand (see Fig. 45), or else in a trough such as that represented in Fig. 49.

Fig. 49.



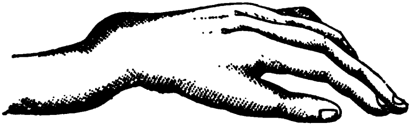
Trough-sling.

Fracture of the lower end of the radius (Colles's) is a common consequence of falls upon the hand. It must be carefully distinguished from dislocation of the wrist. The latter is a very rare accident, while fracture of the lower end of the radius is very frequent.

It may be either simple, comminuted, or impacted: and the signs vary somewhat with the precise nature of the injury.

The case from which Fig. 50 was drawn was that of a boy, aged sixteen, and it may be taken as a typical example. There is a distinct prominence on the dorsal aspect, which looks very much as if a dislocation backwards had occurred at the wrist. Corresponding to this on the palmar surface is a well-marked depression, and above this again there is another prominence, smaller and less distinct than that on the dorsal aspect. The hand is thrown a little towards the radial side, and the styloid process of the ulna becomes remarkably prominent.

Fig. 50.



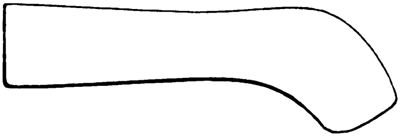
Colles's fracture of the radius.

The prominence on the dorsal aspect is due to the lower fragment of the radius, which is thrown backwards on to the lower end of the upper fragment, carrying the carpus along with it. This also explains the palmar depression. The prominence on the palmar aspect is caused by the lower end of the upper fragment. The obliquity of the hand and the projection of the styloid process of the ulna are due to muscular action, and are brought about by the contraction of the supinator longus, the extensors of the wrist, and the pronator quadratus.

This accident is accompanied by loss of power, particularly in supination, and great pain. In the *Lancet* of June 28, 1873, I have related the case of a woman who fell down a flight of stairs, and simultaneously fractured the lower ends of both her radii. She made a good recovery. Her arms were afterwards strong, and the movements almost perfect, so that she was able to return to her work as a charwoman.

Treatment.—Extension must be made so as to bring the fragments as far as possible into their proper places, and then the hand should be bent strongly over towards the ulnar side. In this position it is to be fixed by means of a "pistol splint" (Fig. 51)—*i.e.*, a straight splint bent downwards at one end so as to adapt it to the shape of the fore-arm and hand when the latter is turned somewhat obliquely. The splint should be long enough to reach from the elbow to the roots of the fingers. It is desirable that it should not extend further, so as to allow the patient to move his fingers. It is generally placed on the anterior aspect of the limb, but, if need be, it may be applied on the posterior, and it should be secured by means of an "arm-bandage." If necessary, a second straight splint may be laid along the opposite side of the arm; and pads may be used to make pressure upon the prominences, so as to keep the fragments of bone in their proper positions. The arm must be carried in a sling.

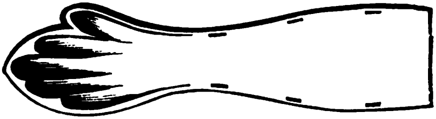
Fig. 51.



Pistol-splint.

This is the usual way of dealing with an ordinary case of Colles's fracture, but if a "pistol-splint" is not at hand the case may be treated perfectly well by two straight splints, such as are used for fractures of the middle of the fore-arm. This plan has the advantage of being less irksome to the patient than the constrained position which the "pistol-splint" involves. But it is always well to warn the patient that, whatever mode of treatment is adopted, some degree of deformity and stiffness will almost invariably remain after this accident.

Fig. 52.



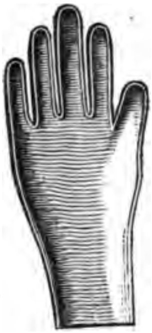
Splint for the hand and arm.

Fractures of the metacarpal bones and phalanges are generally easily detected by the history of the injury, loss of power, pain, and crepitus.

Treatment.—The best mode of treating a fracture of the metacarpal bones is by laying the extended hand upon a wooden or gutta-percha splint cut to the shape of the part. (Fig. 52.)

The surgeon should bear in mind that the palmar aspect of these bones is concave, and he should have the splint well-padded so that it may adapt itself to their form. It is often recommended to treat the central metacarpal bones by binding the hand over a ball of lint or tow. These bones are so well protected by nature that very little padding judiciously placed keeps them in their proper position. If one metacarpal bone only is broken it may suffice to lay a narrow strip of wood along it, reaching from the point of the finger to a short distance above the wrist. This may be laid either along the palmar or the dorsal aspect, and may be secured by strips of adhesive plaster.

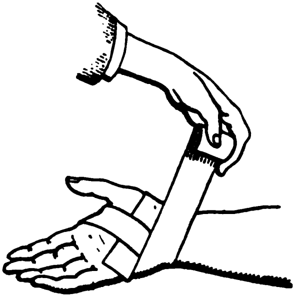
Fig. 53.



Splint for hand.

When the phalanges are broken they should be treated by laying the finger upon a narrow splint of wood, or millboard, or gutta-percha. If the injury is very severe, and several fingers are involved, it may be needful to lay the whole hand flat upon a wooden splint cut to the shape of the thumb and fingers (Fig. 53). Here also the surgeon should bear in mind that the palmar aspect of the bones is concave, and arrange the pad accordingly. If the injury is compound, and an operation is necessary, as little as possible should be taken away. The vitality of the tissues is great: they do not readily slough, and every portion which is left may in due time add to the usefulness of the organ. In all these cases the arm should be supported in a sling so disposed as to raise the hand above the level of the elbow.

Fig. 54.

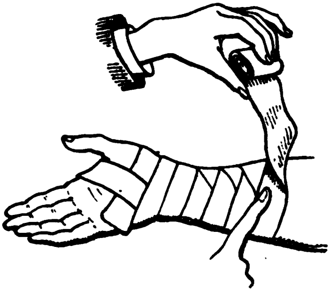


Bandage for the hand.

After these fractures, as well as in various other conditions, it is desirable to bandage the hand and arm. We shall therefore take this opportunity of explaining how it ought to be done.

Bandage for the hand and arm.—A narrow roller is carried in a figure-of-8 round the hand and wrist—one loop including the hand and the other the wrist, and the thumb protruding between the folds. (Fig. 54.) The bandage may then be continued for some little distance up the arm, in simple circular turns; but as soon as it reaches the point where the limb begins to enlarge, "reverses," or figures-of-8, must be made, so as to insure its fitting closely and evenly. (Fig. 55.)

Fig. 55.



Bandage for the hand and arm.

Such a bandage as this may be very conveniently fastened by tearing the extremity down the middle to a sufficient extent, and then turning the two ends round the part in opposite directions, and tying them in a knot or in a bow.

FRACTURES OF THE PELVIS

are often complicated with injury to internal organs, and this makes them very serious. Most frequently it is the front or the back—the rami of the pubes or ischium, or the sacro-iliac articulation—which is broken.

Signs.—Pain, inability to stand or walk, unnatural mobility, and crepitus. The history of the injury by great and direct violence is an important aid to the diagnosis.

The complications which are most likely to arise are rupture of the bladder, or urethra, with extravasation of urine, laceration of the rectum, or fracture through the acetabulum.

Treatment.—A catheter should be passed to ascertain the state of the urethra and bladder. A broad bandage, or a padded belt, should be applied round the hips, the knees should be tied together, and the patient kept perfectly quiet.

FRACTURES OF THE FEMUR

may be considered under three divisions—those of the upper extremity of the bone, those of the shaft, and those of the lower extremity.

In every case of fracture of the lower limb the patient should be laid on a flat, hard bed. Nothing is better than a hair mattress, placed upon the framework of the bed, or upon a straw palliasse. Sometimes flat pieces of wood, about six or seven inches broad—commonly known as "fracture boards"—are laid side by side across the bedstead, so as to form a firm, even surface for the mattress to rest upon.

In all fractures of the lower extremity sand-bags are often of great use to the surgeon. These are cylindrical pillows, four or five inches in diameter, and two or three feet in length, filled with dry sand. The pillow case should be made of strong calico or ticking, and covered first with waterproof cloth, and then with flannel.

FRACTURES OF THE UPPER EXTREMITY OF THE FEMUR.

The fractures which occur about the head and neck of the femur are often extremely difficult to diagnose with accuracy. We shall, however, for the sake of convenience, follow the usual classification, and divide them into intra-capsular and extra-capsular. In either case the fracture may be simple or compound.

Intra-capsular fracture of the neck of the thigh-bone.—This accident is almost peculiar to persons over fifty. It is more common in women than in men, and arises from very slight causes, such as tripping on the carpet, or stumbling over a stone.

As age advances the neck of the bone becomes more horizontal in position, so that the weight of the body falls more directly upon it. The bone-tissue itself also undergoes changes. The cancelli become enlarged, and filled with fatty matter, while the compact tissue is absorbed until nothing is left but a mere shell.

Signs.—Pain, loss of power, crepitus, absence of the natural prominence of the trochanter, shortening and eversion of the leg; but if there is any degree of impaction these signs may be somewhat obscured.

Union may take place by bone, but this is an extremely rare occurrence. In the vast majority of cases the union is fibrous.

This arises partly from a want of perfect apposition between the fragments, and partly from the very scanty supply of blood which the head receives through the vessels of the ligamentum teres.

Treatment.—In these fractures it is seldom necessary to use any splint. As the subjects of this injury are almost always aged, and as bony union is hardly to be expected, it would be useless, and even dangerous, to confine them to bed for any length of time. The patient should, therefore, be kept in the recumbent position for ten days or a fortnight, until the inflammatory symptoms have subsided, and then be allowed to get up and move about on crutches. He will probably be more or less lame for the rest of his life, but with the help of a stick he will be able to walk about with ease.

Extra-capsular fracture of the neck of the thigh-bone is usually the result of great and direct violence. It generally happens before the age of fifty.

The signs are much the same as in the foregoing, only they are more strongly marked.

The injury is often associated with fracture through the trochanter, and there is always much bruising and swelling of the hip. In the case of extra-capsular fracture we aim at obtaining bony union.

Treatment.—A broad bandage should be passed round the hips so as to prevent movement between the fragments. The limb should then be extended, and fixed in that position by means of "Liston's long splint;" or both legs should be flexed, and laid upon a double-inclined plane. These methods will be explained at length in the next section.

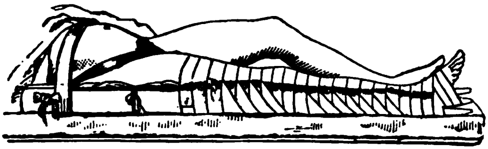
FRACTURES OF THE SHAFT OF THE FEMUR

are of very common occurrence, and can generally be recognised without difficulty. There is pain, loss of power, crepitus, shortening and eversion. The lower fragment is drawn upwards and inwards by the action of the adductors; and, if the fracture is high up, the upper fragment is tilted forwards by the psoas and iliacus, and outwards by the external rotators.

The *treatment* may be conducted either by means of a long splint or a double-inclined plane. The latter is particularly useful in cases where the upper fragment is tilted forwards; but the former is more suitable to the majority of cases. The most convenient long splint is Liston's. The surgeon who is about to use it should be provided with a piece of strong tape, or a silk pocket-handkerchief, long enough to pass from the upper end of the splint round the perineum to the same point, and to be there tied in a bow.

The "perineal band," as this appliance is called, should be well padded at the part where it presses upon the perineum, so as to prevent it from cutting the skin; and care must be taken, particularly in the case of children, that it is kept scrupulously clean. The splint should be long enough to reach from the fold of the axilla to about four inches below the foot. It should be pierced with two holes near its upper end, and at its lower end it ought to be deeply notched in the manner indicated in the accompanying illustration (Fig. 56). It should be well padded, and it is advisable to carry the pad over the upper end of the splint, so as to prevent it from galling the skin of the axilla. The pad should be pierced with holes corresponding to those of the splint so that the perineal band may slip through it easily, and be loosened or tightened at pleasure.

Fig. 56.

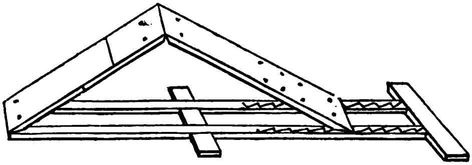


Fracture of the thigh: Liston's long splint.

In applying the apparatus the surgeon first of all takes the padded portion of the perineal band and adjusts it to the patient's perineum, bringing up one end in front and the other behind. He then lays the splint along the outer side of the affected limb, and fastens the foot to the lower end of it. In doing this it is a good plan first to bandage the foot and ankle in the ordinary way, to protect them from the pressure of the splint, and to prevent them from swelling; or instead of this the foot may be enveloped in a layer of cotton-wool. The surgeon should then take a "leg bandage," and make a few turns round the foot and ankle in the form of a figure-of-8, so as to obtain a firm hold; after which he should carry the roller in a regular way round the ankle, and through the notches in the lower end of the splint, so as to fasten it securely to the foot. He should then get an assistant to make extension from the foot while he draws the perineal band tight, and ties it in a bow on the outer side of the splint. In order to keep the apparatus in position, it is sometimes necessary to apply a bandage over both the leg and the splint, and also to put a few turns of a broad roller round the pelvis and chest.

When the fracture runs through the great trochanter and the upper part of the shaft of the femur, without involving the neck, the upper fragment of the bone is apt to be tilted forward by muscular action, as we have already explained. If Liston's long splint is used for a case of this kind it may be necessary to apply a short, well padded splint on the front of the thigh, to counteract any special displacement that may exist. But it is better to treat such fractures on a double-inclined plane. The most convenient contrivance of this sort is that which we have here figured (Fig. 57). By this means a ridge is formed in the middle of the bed over which the patient's legs are laid. This has the effect of bringing the broken fragments of the femur into apposition, and nothing more is needed than to maintain the same posture until union has taken place. A double-inclined plane may easily be extemporized by nailing two pieces of wood together at a suitable angle, or even by an arrangement of pillows. In some of these cases the suspensory method of treatment, which used formerly to be employed, and which has lately been revived in a modified form by Dr. Nathan Smith of Baltimore, may be used with advantage. (See Fig. 59.)

Fig. 57.



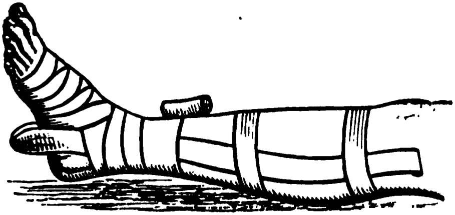
Double-inclined plane.

If the perineum becomes excoriated, extension may be made from the opposite thigh by placing a collar of adhesive plaster round it, and carrying tapes from this to the holes at the upper end of the long splint.

In treating these fractures a great deal may be done by simply attending to the position of the limb without the application of any splint. Thus, if the patient has a sufficient amount of self-control, he may be laid flat on his back, the hollows under the leg and thigh padded with cotton-wool, so as to bring the broken fragments into their proper line, and then a sand-bag placed on each side of the limb. If, in addition to this, the whole is encircled with two or three pieces of tape, an efficient apparatus will be formed, which is as little irksome to the patient as anything of the kind can be. If sand-bags are not at hand, their place may be supplied by a bundle of clean, dry straw, wrapped in a sheet, or by any other suitable material which will give the necessary amount of support, and accommodate itself to the shape of the limb.

Sometimes—more particularly in the case of children—extension may conveniently be made by fastening a loop of plaster under the foot, and attaching a weight to it—the weight being allowed to hang over the end of the bed. The surgeon should take a long strip of plaster, lay it along one side of the leg, pass it loosely under the sole, and bring it up on the other side of the leg. He should then encircle the leg in two or three places with strips of plaster passing round it transversely; and over all he may, if he thinks it necessary, apply a bandage in the way represented in Fig. 58. By this arrangement a loop is left underneath the sole which draws upon the whole length of the leg, and the pressure does not fall upon any one point, so that the risk of irritating the skin, or producing œdema of the foot, is greatly reduced.

Fig. 58.

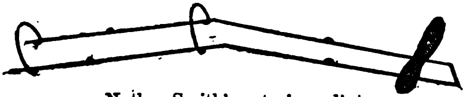


Bandage for extension.

The weight need not be so heavy as to distress the patient. All that is needed is that it should make a slight but constant traction upon the limb. It is a good plan to take a bag and pour dry sand into it, such as is used for making sand-bags, adding a little each day, as the patient is able to bear it, until the proper weight has been attained. Or the bag may be filled with shot, or any other heavy substance; or the ordinary iron weights, which are furnished with a ring on the upper surface, may conveniently be used. By a simple apparatus of this kind, and by placing sand-bags on either side of the leg, splints may sometimes be dispensed with altogether for young subjects. The same method is found of great service in dealing with diseases of the hip and knee.

The apparatus which Dr. Nathan Smith has introduced for treating fractures of the femur, among its other advantages, is particularly suitable to cases in which the back of the limb has been much bruised. It consists of a couple of light iron rods, bent at such an angle as to suit the shape of the thigh and leg when slightly flexed (Fig. 59). The rods are connected together at their lower end, and a space is left between them sufficient to receive the limb. From one rod to the other strips of bandage are fastened transversely, side by side, so as to form a trough, fitted to the shape of the leg and thigh. Upon this the limb is laid, and then the rods are attached to cords which are suspended from a point above the bed, and which are regulated by pulleys. The hook to which the cords are fastened ought to be placed, not immediately over the limb, but a little in front of it, so as to make extension, while the weight of the patient's body supplies a counter-extending force. This apparatus has the merit of being remarkably simple, cheap, and clean. Moreover, it enables us to swing the whole of the lower extremity, and to give the thigh some of that relief which we can afford to the knee and the leg by means of "Salter's Swing." (See Fig. 68.)

Fig. 59.



Nathan Smith's anterior splint.

After the patient has been treated by any of these methods for five or six weeks, a flannel bandage, or a starch bandage, should be applied, and he should be allowed to move about on crutches.

Some surgeons treat fractures of the femur by simply confining the patient to bed for a few days, and then putting up the whole leg and thigh in a starch bandage. This method has the advantage of permitting the patient to go about on crutches while union is taking place. At the same time there is more risk of malposition than when the patient is confined to bed until consolidation has taken place. It must also be borne in mind that the femur is one of those bones in which non-union is very apt to occur, and where it is especially desirable that the fragments should be kept at rest and in apposition.

In cases of *compound fracture of the femur* the course which must be adopted depends entirely upon the extent and severity of the wound. When this is slight the limb may be put up in the way described already, and the wound sealed, or treated on general principles. But when the main vessels are torn, or when the injury to the soft parts is very extensive, the question of amputation will have to be considered. (See p. 60.)

FRACTURES OF THE LOWER EXTREMITY OF THE FEMUR

may be either transverse or oblique. When transverse, they generally occur in young subjects, and follow the line of the epiphysis. When oblique, they are apt to extend into the joint.

Treatment.—When the femur is broken near its lower end, great care should be taken to keep the limb at rest so as to prevent, as far as possible, any inflammation of the knee-joint. The simpler cases of this kind may be treated by means of Liston's long splint and a perineal band (see p. 148). But if the injury is more severe, or if the patient is restless, it is better to put the limb upon a "M'Intyre's splint" (see fig. 63), which gives perfect support to both the thigh and the leg, while it prevents any movement at the knee-joint. If the limb is slightly flexed upon the splint, and then laid in a "Salter's Swing," it will give the patient great comfort, and afford him the best chance of a good recovery. It must be remembered that in a severe case of this kind anchylosis may take place, and that in such an event a slight degree of flexion at the knee is the position which will leave the patient the most serviceable limb.

If the fracture is compound, and the joint opened, the case will probably require immediate amputation.

FRACTURE OF THE PATELLA.

The patella may be broken either by direct violence or by muscular action. When it is broken by direct violence the fracture may take any direction, or it may be comminuted. When it is the result of muscular action it is always transverse. The bone being fixed below by the ligamentum patellæ, and stretched upon the condyles of the femur at the moment when the leg is bent, the violent contraction of the extensors tears it across. The accident generally occurs in the sudden effort made by a person to save himself from falling backwards.

Signs.—Inability to stand, or to extend the joint, and crepitus. The line of fracture may be felt; if it is transverse, the fragments are widely separated.

The kind of union which results varies with the nature of the accident. If the fracture is longitudinal or comminuted, union takes place by bone; but when the fracture is transverse, the union is almost always fibrous. The chief reason for this is that in the former class of cases it is generally easy to keep the fragments in apposition; while in the latter we always find that there is such a wide interval between the pieces of bone that it is very difficult to bring them together, and to retain them in that position.

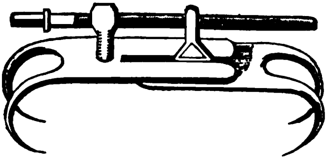
The *treatment* of the longitudinal and comminuted fractures consists simply in extending the leg upon a light wooden back-splint, and then relaxing the extensor muscles of the thigh by propping the patient up in bed with pillows, so as to place him in the semi-recumbent position; or—which has the same effect—by laying him nearly flat, and raising the limb upon pillows or in a swing, so as to flex the thigh on the pelvis. When one position becomes irksome it may be exchanged for the other, or one may be maintained during the day, and the other at night, care being taken always to preserve the same angle at the hip, so that the extensor muscles of the thigh may be kept constantly relaxed. If there is much swelling or inflammation about the joint, or if the soft tissues are extensively bruised, it may not be advisable to apply a back-splint at once. In such a case the leg should be simply laid upon a pillow, and treated with cooling lotions or with fomentations until the acute symptoms have subsided; and then the limb may be put upon a splint. If there is any fear of anchylosis, the surgeon should bear in mind that the most useful position for the patient is that in which the leg is slightly flexed.

The treatment of transverse fractures is less satisfactory. In a case of this kind the patient should be laid in one of the positions that we have already described, so as to relax the muscles, and allow the broken fragments of bone to approach one another. If there is much inflammation about the knee-joint, it may be impossible to do more than this for a few days. After the swelling has been subdued it is well to extend the leg upon a back-splint. A concave one made of wood is perhaps the best that can be employed. It ought to be long enough to reach from the middle of the thigh to the middle of the leg, and it should be well padded. It may be fastened either with broad strips of plaster or with a few turns of a bandage at its upper and lower end—the seat of fracture being left uncovered. These simple means often suffice to bring the broken fragments nearly together, and although a great deal of ingenuity has been expended upon the treatment of these injurics, it is a question whether any better or safer method than this has been devised.

If, however, the surgeon is anxious to try and bring the fragments into closer apposition, there are a variety of means at his disposal. In addition to the back-splint he may place a collar of adhesive plaster round the thigh, attach tapes or elastic bands to each side of it, and carry them down and fasten them to a slipper on the foot, or connect them with weights, and suspend them over the end of the bed. The collar of plaster should be about two inches broad, and should overlap the upper fragment of the patella, so that the traction may be exerted upon the broken bone, and not merely upon the skin. Or he may endeavour to draw the upper fragment downwards by a figure-of-8 bandage applied over the back-splint, and the effect of such a bandage will be considerably increased if a pad of lint is laid upon the upper edge of the upper fragment. This pad may be fixed in its place by a strip of adhesive plaster, and then the roller applied over it. Mr. John Wood has devised a splint for these cases, which gives the figure-of-8 bandage a better hold, and increases its power. It consists simply of a straight concave iron splint furnished with two hooks behind the knee. The hooks are placed back to back, and at such a distance from one another as to give the bandage a suitable degree of obliquity. The same principle has been applied yet more simply by cutting notches in the sides of a straight wooden splint, and fixing the loops of the figure-of-8 bandage upon them (see Hamilton on Fractures). When any apparatus of this kind is used, or when any bandage is applied which compresses the limb, care must be taken to cover the leg with a roller from the toes to the knee, in order to prevent the swelling which is apt to arise.

The objection to the methods I have described in the foregoing paragraph is that they have a tendency to tilt the upper fragment forward, and to throw it out of its proper place—so difficult is it to act upon a small and very moveable piece of bone.

Fig. 60.



Malgaigne's hooks.

M. Malgaigne has endeavoured to overcome this difficulty by a direct method of treatment. With this view he has devised the hooks which bear his name (Fig. 60). These hooks are fixed into the tendons at the upper and lower edge of the patella, so as to obtain a firm hold of the margins of the bone, and then drawn together by means of a screw, which is worked with a key. The pain of applying the hooks is trifling, and most patients bear them without discomfort; but it should be remembered that considerable inflammation of the joint has taken place in some cases in which they have been used, and for this reason they are not regarded with much favour by English surgeons.

Whatever method of treatment is adopted it must be continued for about six weeks, and then the patient may be allowed to get up and move about upon crutches, wearing an elastic knee-cap, or having a light splint applied to the back of the joint. In this case, as well as in many others, it is always desirable to warn the patient that some degree of lameness is almost certain to remain as a result of the injury.

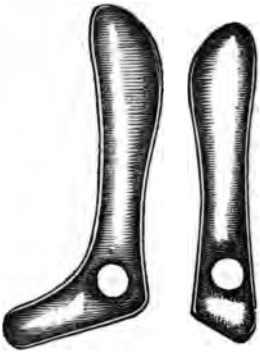
FRACTURES OF THE LEG.

When both bones are broken the fracture is easily detected by the loss of power, shortening, mobility and crepitus; when only one has suffered, especially if that one be the fibula, the diagnosis is more difficult. The commonest seat of fracture is at the junction of the middle and lower third of the leg. The fracture may be either transverse or oblique. If oblique, the fissure runs from above downwards and backwards. The lower fragment overrides the upper, in consequence of the action of the muscles of the calf, and is very apt to protrude through the skin.

Treatment.—In a case of simple fracture of both bones, if there is but very little swelling or displacement, it sometimes suffices to confine the patient to bed for a few days with his leg laid between sand-bags; and then the leg may be encased in a starch bandage. This plan has the advantage of allowing the patient to move about on crutches while union is taking place; but the surgeon should be careful to examine the limb from time to time, to see that the bones are in their proper position. In the great majority of instances, however, there is so much displacement, or mobility, that the patient must be confined to bed for a longer period, and the leg fixed by some kind of apparatus. The means which have been devised for this purpose are numerous; but here, as elsewhere, the simpler and less complicated the splint the more generally useful will it be found.

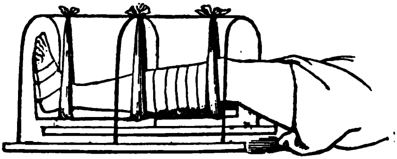
In all ordinary cases of simple fracture of both bones, the best plan of treatment is to apply two side-splints with foot pieces, the splints being well padded, and secured above and below the seat of fracture by broad strips of plaster, or by a few turns of a roller. Some surgeons are of opinion that the outer splint only should have a foot piece, the inner one being cut off at the ankle. (Fig. 61.) But there seems no sufficient reason for this, and it is more convenient to have both splints of the same shape, so that they may be available for either leg. After the side-splints have been applied, the limb may either be simply laid on the bed—placed, if need be, between a couple of sand-bags — or it may be supported in a "Salter's Swing" (see Fig. 68)—or suspended under a common cradle by a few loops of bandage. Such a cradle may easily be made of light iron rods bent so as to form a series of arches connected by narrow bars of wood. (Fig. 62.) To keep the patient from hurting his leg during sleep, the cradle should be padded with cotton-wool or covered with a roller. This method of swinging the leg not only gives comfort to the patient, but also tends to prevent the injury which might arise from involuntary starting of the limb.

Fig. 61.



Side-splints for the leg.

Fig. 62.



Leg placed on a back-splint, and suspended under a cradle.

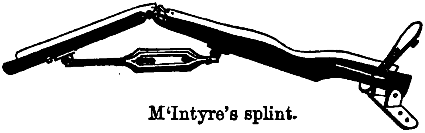
Another excellent plan of treating simple fractures of the leg is to use a straight iron back-splint, about four or five inches broad, and bent upwards at its lower end so as to form a foot-piece (such as is seen in Fig. 62). The material of which the splint is made should be thin and pliable, so as to allow the surgeon to adapt it in some degree to the shape of the foot and leg. It should be thoroughly padded, especially above and around the heel, so that the weight of the foot may be diffused over the ankle and leg, and not fall entirely upon the heel; for the skin in this situation, like the skin over all other bony prominences, is excessively prone to become inflamed, and to ulcerate, under continued pressure. If the simple back-splint is not found sufficient to keep the leg in position, a straight wooden splint may be added on one or both sides to give lateral support. In putting up a fracture of the leg it is well to leave the crest of the tibia as far as possible uncovered, so that the surgeon may run his finger along it from time to time, and ascertain the position of the fragments.

If the line of fracture through the tibia is oblique, as it frequently is, and if there is danger of the lower fragment piercing the skin, it is desirable to relax the muscles so as to prevent them from acting upon the bones, and converting a simple fracture into a compound one. In order to do this the leg may be laid on its outer side upon a broad side-splint, the leg and the thigh being both flexed. But, as this position is apt to become irksome, it is more usual to carry out the same indications by putting up the fracture with side-splints, or with a back-splint, in the way already described, and then swinging the limb in such a manner as to flex both the hip and the knee.

When one bone alone has been broken there is generally but little displacement, the sound bone helping to keep the broken one in its proper position. In such a case the surgeon may have recourse to any of the foregoing methods, being guided in his choice by the age and temperament of the patient, as well as by the details of the injury. For example, a child, or a patient whose self-control cannot be depended upon, must be confined to bed, and means used to insure the perfect repose of the limb; but in other instances the fracture may, after a day or two, be put up with a starch bandage. When the fibula alone is broken, it will sometimes suffice to apply strips of plaster and a bandage round the leg in the way described in speaking of sprained ankle (see p. 100).

Compound fractures of the leg are far from uncommon. When the wound is slight a pad of lint should be applied, upon which the blood will coagulate, and thus seal the wound; or the pad may be saturated with collodion or Friar's balsam. The limb may then be put up with side-splints, or with a back-splint. If a point of bone protrudes, and cannot easily be reduced, it should be removed with the saw or bone-pliers. If the wound is of larger size, and the soft tissues are much injured, suppuration can hardly be prevented. It is then well to have recourse to a M'Intyre's splint (Fig. 63), *i.e.*, a concave iron splint, with a thigh-piece and a foot-piece, and a joint at the knee regulated by a screw, so that it can be fixed at any angle, and the whole leg kept perfectly at rest. Whether the wound is great or small, or whatever may be the kind of splint selected, care should be taken to leave the seat of injury uncovered, so as to allow the surgeon to examine, and treat it, without disturbing the position of the limb. In putting up such a fracture it is a good practical rule to keep the ball of the great toe in a line with the inner edge of the patella. To facilitate this it is well to have at hand one or two small soft pads, which may be used to make pressure upon particular points, in order to bring the broken fragments into their proper line.

Fig. 63.



M'Intyre's splint.

In treating these fractures, the surgeon will find that he must vary his appliances according to the details of each particular case. Among fractures which present much the same appearances, and which seem to belong to the same class, one case will do well between side-splints; another will require a back-splint, with or without lateral support; while a third will have to be laid upon a M'Intyre's splint before it can be brought into a satisfactory position.

If the fracture is not merely compound, but the whole thickness of the limb is crushed and disorganized, immediate amputation will be necessary.

Compound fractures of the leg are often associated with troublesome hæmorrhage. If the injury is in the middle or upper third of the leg, amputation will almost certainly be inevitable; if it is in the lower third, it may be possible to secure the bleeding vessels.

FRACTURES ABOUT THE ANKLE JOINT.

When the foot is violently twisted outwards, the fibula is apt to give way about two or three inches from its lower end, and such fractures are frequently attended with more or less injury to the ankle joint.

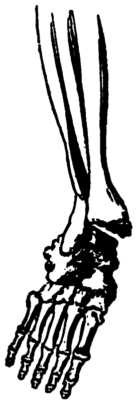
The diagnosis is not difficult inasmuch as the seat of fracture can be felt.

In the simplest cases of this class the fibula alone is broken, whilst the internal lateral ligament of the ankle joint is stretched or lacerated. When this is the whole amount of the injury, there is generally little or no displacement of the foot, and the only symptoms besides the fracture are swelling and extravasation of blood about the ankle. Here simple means will suffice for a cure. The leg should be laid upon a pillow for a few days, and then the fracture can be put up with strapping and a bandage, or with a starch bandage. Indeed, in some cases, if the patient's time is valuable, the leg may be strapped and bandaged at once, (see p. 100).

If the swelling is considerable, it is well to treat the injured part with cold lotions (F. 18, 20), or with fomentations; and if these are retained by a many-tailed bandage, a little gentle pressure may be exerted at the same time.

But if the case is more severe than this—if, in addition to the fracture of the fibula and the laceration of the internal lateral ligament, the internal malleolus is snapped off as well—then it will be necessary to confine the patient to bed, and to keep his leg at rest by some kind of apparatus. The first step in the treatment should be the same as in the simpler cases—the leg should be laid upon a pillow, and local measures used to subdue the acute symptoms. After this has been effected the leg should either be simply laid between sand-bags—the sand-bags and the limb being encircled at intervals by loops of bandage, or broad tape, so as to keep the whole in position—or else it may be fixed between a couple of side-splints with foot-pieces, the splints being secured by a few turns of a roller above and below the fracture, or by bands of webbing and buckles.

Fig. 64.



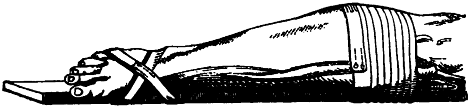
Pott's fracture.

When the fibula is broken and the internal lateral ligament ruptured, the foot not unfrequently suffers a partial dislocation outwards in the manner described by Mr. Percivall Pott. This is clearly shown in Fig. 64, which is reduced from the original illustration in Pott's "Remarks on Fractures and Dislocations," 1768.

The same thing may happen when the internal malleolus is splintered off. The toes point outwards, and the external border of the foot is turned slightly upwards. As this displacement is due in part to the action of the muscles which pass under the outer malleolus, our object must be to relax them. With this view the knee and the ankle should be moderately bent, and then the leg may either be laid upon its outer side on a side-splint, or fixed between two side-splints with foot-pieces, care being taken to apply the roller in such a way that the outer splint shall press the foot inwards towards the median line.

It is in cases of this kind that the short straight splint, known as Dupuytren's, is sometimes used. The accompanying illustration (Fig. 65) shows the form in which it was originally employed by the eminent surgeon whose name it bears, and the way in which he was in the habit of applying it. It is an ordinary straight wooden splint about three inches broad, and long enough to extend from the knee to a short distance below the sole of the foot. It should be well padded, so as to adapt itself to the inside of the leg, the pad being especially thick and firm where it fits into the hollow above the internal malleolus. The splint is applied along the inner side of the leg, and secured at its upper end by a few turns of a roller. The foot is then bent over the thick portion of the pad, which serves as a fulcrum, so as to press outwards the upper end of the lower fragment, and retained in this position by broad strips of plaster, or by a bandage. The limb, with the splint affixed, may be semiflexed upon its outer side on a pillow, or upon its inner side as in the illustration. In modern practice, however, a modification of Dupuytren's apparatus is generally preferred. It consists of a short straight splint pierced with holes near its upper end, and furnished with deep notches at its lower—in fact, it is like Liston's long splint on a smaller scale (Fig. 66). It should be

Fig. 65.



Dupuytren's splint applied.

Fig. 66.

Modern form of Dupuytren's splint.

well padded, especially above the internal malleolus, and then applied on the inner side of the leg, secured at its upper end by a few turns of a roller, and below by a figure-of-8 bandage passing through the notches, and embracing the instep and heel alternately. When the fracture has been put up in this way, the limb may be laid on its back, or suspended in a "Salter's swing" (see Fig. 68).

In treating these cases of fracture of the fibula with injury about the ankle joint, the splints ought not to be used for more than a month or five weeks for fear of anchylosis; and at the end of that time the surgeon should begin to make passive movements, so as to secure the mobility of the joint.

When both bones of the leg are broken near the ankle joint, the injury is almost always the result of direct violence, and the fracture is frequently compound or comminuted. In such a case the foot may be displaced in various directions, and the toes pointed either inwards or outwards. No very precise rules can be laid down for the treatment of such injuries. Each case must be dealt with according to the peculiarities which it presents. Sometimes the leg may be simply laid upon a pillow, or upon a broad side-splint; sometimes a short straight splint, placed either upon the inner or outer side of the limb, may be the best means of overcoming the displacement; sometimes a pair of ordinary side-splints may be the most efficient mode of treatment; sometimes a common back-splint with a foot-piece, or a M'Intyre's splint, will bring the leg into the best position; and sometimes the surgeon will have to cut down a wooden splint and shape it so as to meet the special requirements of the case.

FRACTURES OF THE TARSAL AND METATARSAL BONES.

These fractures are usually the result of great and direct violence. They are not unfrequently compound, or complicated by dislocations, and there is always much injury to the soft parts.

Treatment.—Here, as in the case of the severe fractures about the lower portion of the leg, it is impossible to lay down any precise rules for the guidance of the surgeon. He must study the particulars of the injury, and then select the most suitable of the methods enumerated in the preceding paragraphs. It often happens that a paste-board or gutta-percha splint moulded to the part will be found more efficient, and more comfortable than any other apparatus. Such a splint may be so shaped as to give support to the sound parts, while it permits the surgeon to dress the wounds, and allows a free escape for the discharge.

When the calcaneum is broken a gutta-percha splint should be moulded upon the heel, and the leg flexed so as to relax the muscles. In the same way, when the tendo Achillis is ruptured, the leg should be bent at the knee, and retained in that position by a cord connected at one end with the heel of the patient's slipper, and at the other with a bandage passing round the thigh. After either of these injuries the patient should wear a high-heeled shoe for some time when he begins to walk about.

In the severer injuries about the ankle and foot, more particularly if the fracture is complicated with a dislocation, it may be necessary to remove some of the bones. The astragalus has frequently been removed in this manner, and the cases have turned out remarkably well. If the patient is old or sickly amputation may be the only resource.

Crutches.—When a patient begins to move about after any severe accident or operation involving the lower extremities, he has generally to support himself upon crutches until he recovers the use of his limb. The crutches should be just long enough to enable him to raise the injured leg off the ground, while he stands firmly upon the other. The cross-bar should be well padded so as to form a cushion upon which he may bear his weight. If this is not done the pressure upon the axillary nerves may be such as to lead to a partial paralysis of the arm. In hospital practice it is always well to wrap a piece of leather or cloth under the lower end of the crutch to prevent it from slipping. This is necessary because patients are rather awkward when they begin to use crutches, and if the floor of the ward is waxed, or if it has been recently washed, they are very apt to fall.

The best crutches that we can recommend in private practice are those in which the shaft and the handle are made out of a single piece of wood. Sometimes a spring is put in the upper part of the shaft, so as to give elasticity to the cross-bar. They should be tipped with little leather shoes to keep them from slipping.

If the state of the injured limb is such that the patient ought not to use it at all, it is a good plan to support it with a bandage passed under the foot, the ends being brought up evenly in front, and tied behind the neck. In this way a sort of sling is made which assists the patient in keeping his foot off the ground.

DISEASES OF JOINTS.

Acute Synovitis may arise from external injury, but more often it is caused by cold or wet. It is often associated with a gouty, rheumatic or syphilitic habit, and it usually attacks those joints which are most exposed; *e.g.*, the ankle or knee.

During the early stage the synovial membrane is red and vascular. If the disease continues it gradually becomes thickened and villous. The quantity of fluid secreted is greatly increased. At first it is clear and serous. Subsequently it becomes turbid and contains flakes of lymph, or is mixed with blood. Ultimately it may become purulent, and when this happens the cartilages are very apt to ulcerate.

Symptoms.—Heat, pain gradually increasing in intensity, and great tenderness, early and rapid swelling, which is very characteristic, inasmuch as it shows itself between the bony prominences, wherever the synovial cavity can find room to expand. Thus, in the knee, where it is so often seen, it assumes something of a horseshoe form round the sides of the patella, between that bone and the condyles of the femur. There is fluctuation. The joint is flexed and powerless, and there is great constitutional disturbance.

Treatment.—The joint should have perfect rest upon a splint. Fomentations or poultices, plain or medicated, should be continuously applied. Sometimes cold lotions give most relief. If the patient is plethoric, and the inflammation runs high, blood should be freely drawn from the joint by leeches. If the hip or the knee is affected, extending the limb by means of a weight gives great relief in some cases, even in the acute stage.

At the outset of treatment a purgative should be prescribed, and this should be followed by salines. If the attack is associated with a gouty, rheumatic, or syphilitic state of constitution, colchicum, the alkalies, and the iodide of potassium should respectively form part of the treatment.

If there is reason to suspect, from the occurrence of rigors, that suppuration has taken place, a grooved knife or needle should be introduced into the joint to ascertain the fact, and then an incision—and if need be, a counter-incision—should be made, and poultices applied.

In traumatic cases the continuous application of an ice-bag, or a strict adhesion to Lister's antiseptic method of treatment, will be the most likely means of securing a favourable result.

As the knee joint is very often attacked with synovitis, we may take this opportunity of mentioning that a convenient bandage for retaining poultices or dressings upon the knee or in the popliteal space, as well as in other situations, may be made by taking a piece of calico about a yard and a half long and a foot wide, and tearing it up the middle from each end to within six inches of the centre. It is applied in the following manner:—The surgeon lays the central portion either over or under the knee, as the case may require, and brings the two upper tails round the limb, and crossing them, carries them back to the point from which he started, and ties them there. The two lower tails are then fastened in a similar manner.

CHRONIC SYNOVITIS

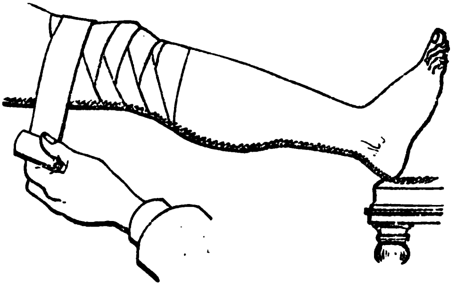
is often the result of the foregoing, though sometimes the inflammation has from the first a subacute or chronic character.

There is less pain and tenderness than in the acute form, but the joint is swollen, and the synovial membrane thickened and pulpy. In many instances when pressure is made upon it, a fine crackling can be felt—the result of effusion into the meshes of the areolar tissue. When the accumulation of fluid in the joint is great, while the inflammatory symptoms are almost, or quite absent, the disease is termed *hydrops articuli* or *hydrarthrosis.*

Treatment.—In chronic, as in acute synovitis, there is usually some constitutional taint which must be met by its appropriate remedies. With regard to local treatment it is of the utmost importance to give the part perfect rest on a splint, and to make regulated pressure by means of a bandage. The joint should be rubbed with stimulating ointments or embrocations, or it should be painted with lin. iodi, or blistered, or strapped, with or without the application of "Scott's dressing." This dressing takes its name from "Scott, of Bromley." It is very useful in many of the chronic diseases of joints, and is applied in the following manner:—The joint is first sponged with camphorated spirit, and then evenly covered with strips of lint spread with strong mercurial ointment mixed with camphor (ung. hyd. co.). The strips of lint should be about two inches broad, and they ought to be applied in the same way as a many-tailed bandage. The ends ought to overlap one another a little, but care must be taken that this overlapping does not happen to fall upon any bony prominence, such as the patella. After the joint has been covered with the strips of lint it should be encircled in the same way with strips of leather plaster, so as to form a firm, dry case. Over this a bandage may be applied, and by this means a degree of pressure may be employed if it seems desirable. The dressing may generally be allowed to remain on for a week or ten days before it requires to be renewed.

Bandage for the knee.—It often happens that the surgeon has to bandage the knee either to give it support after fracture, or to exercise gentle pressure upon it, as in some of the diseases to which the joint is liable. The bandage may be most conveniently applied in the form of a figure-of-8. (Fig. 67.) The end of the roller should be laid upon the outer side of the head of the tibia, carried round the back of the leg from without inwards, and somewhat obliquely from below upwards. Then it should be brought round the inside of the leg, and carried across the front of the joint, still tending obliquely from below upwards. Then round the back of the thigh in a transverse direction to its inner side, from whence it is conducted obliquely across the front of the joint from above downwards to the point at which it commenced. These figures may be repeated as often as they are necessary; each one rising a little higher up the limb than the preceding one, and care being taken that the corresponding folds are equidistant from one another. The turns ought not to cross one another directly over the patella, but a little to its outer side. It will be observed that the appearance of this bandage, when properly applied, is very much the same as that produced by "reverses."

Fig. 67.



Bandage for the knee.

LOOSE CARTILAGES IN JOINTS.

Loose cartilages are most frequently met with in the knee joint. They seem to commence in a thickening of the fringes of the synovial membrane, the result of chronic synovitis. They are usually composed of condensed fibrous tissue. It is seldom that they have a cartilaginous structure. They can be felt, and moved. Sometimes they come between the articular surfaces, causing great pain, and perhaps making the patient fall suddenly *to* the ground.

Treatment.—Sometimes they can be fixed in one corner of the joint by an elastic knee-cap or bandage, until they contract adhesions. Mr. Hilton recommends that the joint should be kept perfectly at rest, and counter-irritation applied over the loose cartilage with a view of procuring its absorption. If the sufferings of the patient are great, and if milder measures have failed, the loose cartilage may be pushed into a corner of the synovial cavity, and removed by a subcutaneous incision. But this operation, simple though it sounds, is not unattended with danger, and should not be undertaken except as a last resource.

ARTHRITIS.

By arthritis is meant an inflammatory condition of a joint affecting more or less all the structures that enter into its composition. It is the commonest form of joint-disease which we meet with in adult life.

It may be either *acute* or *chronic.* It may begin in the synovial membrane, or in the ligaments, or in the cartilage, or in the bones, and spread thence to the adjacent parts.

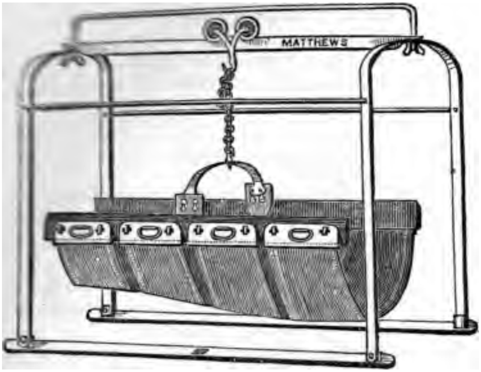
It generally occurs in persons who are of an unhealthy constitution, or who are out of condition at the time. It is often excited by twists, blows, or wounds. Sometimes it is a consequence of pyæmia, or puerperal fever.

Symptoms of acute arthritis.—The whole tissues of the joint are somewhat swollen; the skin is hot, and pervaded by a slight blush. The tenderness is such that the patient cannot bear the part to be touched. The pain is exquisite, and aggravated by the least movement. It is commonly referred to one spot, and is generally worse at night. There are painful startings of the limb, which prevent the patient from sleeping, and add greatly to his sufferings. With these local symptoms there is usually a high degree of constitutional disturbance.

The disease spreads rapidly, and the various tissues of the joint soon become affected. The cartilages ulcerate, the synovial membrane becomes thickened and gelatinous, the ligaments are softened and disorganized, the joint becomes unnaturally moveable, and the articular surfaces grate upon one another. Suppuration commonly takes place, and, if the joint is not opened, the matter makes its way to the surface at various points.

In the *treatment* of a case of acute arthritis, the patient should be kept perfectly at rest; the affected limb should be fixed on a splint, or be laid between sand-bags. If it is the knee that is diseased, great relief will be given by extending the limb by means of a weight hung over the end of the bed, or by suspend-ing the leg in a "Salter's swing." (Fig. 68.) The joint should be freely leeched and constantly fomented; calomel should be given in combination with opium, and the general treatment must be strictly antiphlogistic. If the inflammation subsides without the formation of matter, and falls into a subacute or chronic stage, counter-irritation by blisters or iodine paint, or encasing the part with strips of emp. belladonnæ, or emp. ammoniaci c. hydrargyro, or the application of "Scott's dressing," will be found very beneficial.

Fig. 68.



Salter's swing.

If suppuration takes place, a free incision—and perhaps a counter-incision—must be made into the joint, and poultices applied. If it is one of the larger joints that is affected, as the hip or the knee, the patient will be in great danger of sinking from exhaustion or hectic. If he recovers, it will probably be with a stiff joint. The limb should therefore be placed at the outset, and maintained during treatment, in such a position as shall be most useful in case anchylosis should result.

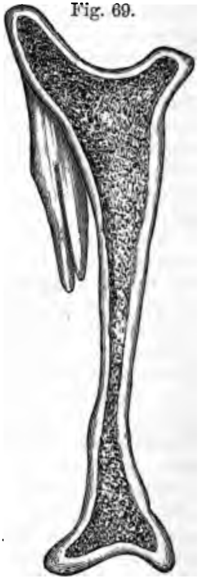
CHRONIC RHEUMATIC ARTHRITIS

affects small and large joints alike. It is essentially chronic in its character. It is usually preceded by a low and depressed state of the general health, and seems to depend almost as much on the state of the nervous system as on the condition of the blood. It steals on gradually from joint to joint. There is dull, aching pain, at first slight and intermittent, afterwards severe and constant. In the early stages of the disease the movements of the joint are only impeded by the pain, but in the later stages they are limited by the changes that take place in the articular surfaces; and then a distinct grating may be felt on moving the joint.

Where there is pressure the cartilage becomes gradually worn away, and the subjacent surface of bone grows hard as ivory (eburnated). In other situations, the cartilage becomes irregularly developed, and an ossific deposit takes place in it and in the white fibrous tissues. Together with these deposits the cancellous tissue of the bone sometimes becomes distended. The joint becomes more or less fixed, and the muscles waste. Fig. 69 represents a section of the tibia of a man who was long under my observation. The articular extremities of the bone were expanded, the cartilages absorbed, the surfaces of the joints like porcelain, the ligaments thickened, and portions of the muscles—especially the tibialis anticus—ossified. In this patient many joints were similarly affected.

Treatment.—We can do little either to arrest the progress of the disease, or to repair the damage it has done. Tonics are essential: for example, the preparations of iron, or cod-liver oil. Friction, with stimulating liniments, warm clothing, a good but regulated diet, and attention to the general health, are points which must not be overlooked. A visit to the thermal springs of Bath or Aix-la-Chapelle may perhaps be beneficial.

Fig. 69.



Chronic rheumatic arthritis.

ULCERATION OF CARTILAGE

may occur as the result of synovitis, or it may depend upon disease of the subjacent bone, or it may originate in the cartilage itself.

Ulceration beginning in the cartilage itself is a rare disease; but as a consequence of synovitis, or scrofulous inflammation in the cancellous ends of the bone, it is very common.

The *treatment* resolves itself into that of synovitis, arthritis, or scrofulous disease of joints.

SCROFULOUS DISEASE OF JOINTS

(white swelling) occurs chiefly before the age of puberty, and in those who are of a strumous habit of body. Its exciting cause is sometimes very slight—*e.g.*, a blow or a sprain.

Sometimes the disease seems to begin in the synovial membrane, sometimes in the cancellated tissue of the bone. Wherever it commences, the morbid action soon pervades both the hard and the soft tissues; the ends of the bones become enlarged, the cancelli dilated and filled with fat or tubercular matter, the synovial membrane vascular and pulpy, and the subcutaneous tissues swollen and thickened.

When the disease is fully established, the joint has a very characteristic appearance. It is gradually and uniformly enlarged, the surface is pale, with blue veins traversing it, the skin is doughy or œdematous, and after suppuration has taken place, there are generally the marks of sinuses in various situations.

The patient lies with his limb semi-flexed. He has not much pain, except when the joint is moved. The muscles of the affected part waste from disuse, and there is gradually a total loss of power. At the same time the general health suffers, there are the constitutional marks of scrofula, and when suppuration takes place, the patient is very apt to fall into a hectic state.

Treatment.—The joint should be kept perfectly at rest by means of a splint, and in such a position as shall make the limb most useful in the event of anchylosis.

If the symptoms are but slight the patient should wear an elastic bandage, or a light splint made of gutta-percha or sole leather; and he should be very careful that the joint sustains no injury. Thus, if the elbow is affected he should avoid all blows upon it, and if the knee is the part threatened, walking over rough ground, dancing, running, and everything that can jar or twist the joint should be forbidden.

If the inflammation is acute, leeches may be required. But depletion of any kind should be used with caution, for we are dealing with a disease which is the result of debility. Fomentations should be constantly applied. Counter-irritation, or the application of blue ointment and camphor (Scott's dressing), may be of use. But what is likely to do most good is constitutional treatment, combined with rest. The patient should have plenty of sunlight and fresh air; if possible, he should go to the seacoast. His diet should be generous, but well selected; and he should take cod-liver oil or steel, or other tonic medicines.

If matter forms, it should be let out at once, and a poultice applied. If the suppuration is profuse, it must be dealt with on general principles. As a last resource excision, or amputation, may be performed.

ANCHYLOSIS

means the union which not unfrequently takes place between the articular surfaces of bones. It is always the result of inflammation. Sometimes it is *membranous* or *fibrous*, at other times it is *osseous*.

Fibrous or membranous anchylosis occurs in those cases in which the inflammation has been confined to the synovial membrane and cartilage, and in which the bone has not been exposed. The opposed surfaces are held together by fibrous tissue, or by adhesions of plastic lymph.

Osseous anchylosis takes place, when the deeper tissues have been exposed, and the two bony surfaces are able to coalesce, and grow together.

Treatment.—When a joint is in danger of becoming stiff, it should always be placed in the most useful position. The knee, for example, should be extended almost, though not quite, to the full; the elbow bent to something less than a right angle.

If the anchylosis is fibrous, and the limb is in good position, passive motion should be made, and the joint bathed with cold water, or rubbed with stimulating embrocations, in the hope of exciting healthy action, and restoring some degree of movement; but if the limb is fixed in a bad position, the patient should be anæsthetized, and force applied to the joint, so as to bring it into a more useful posture, and then, if the surgeon thinks fit, passive motion may be made.

In dealing with diseases or injuries which involve joints, either directly or indirectly, the surgeon should bear in mind the readiness with which membranous adhesions are formed, and endeavour to prevent them by timely movement. These are the cases which furnish the bone-setters with their successes. Dr. Wharton Hood has shown the principle which underlies their rough-and-ready treatment, and has enabled scientific surgery to learn a lesson from quackery—*Fas est et ab hoste doceri.* Dr. Hood has pointed out that when there is no active disease in a joint, except such as is kept up by the irritation of the membranous bands—when there is a certain amount of movement, checked by pain, and that pain referable to a single spot, we may assume that adhesions are the source of the patient's trouble, and endeavour to break them by quick decisive movements of flexion and extension. Of course, in applying this treatment, great care must be taken in arriving at a diagnosis, and in excluding all possibility of active disease in or around the joint. It is applicable to joints crippled by injury, by inflammation, by strumous, gouty, or rheumatic disease; but where there is a constitutional tendency to articular affections, as in the case of strumous or gouty persons, it must be used with even greater caution. (Hood, "On Bone-setting, so-called.")

If the anchylosis is osseous, nothing can be done to alter it. We must either be content with the limb as it is, or else perform an excision or an amputation.

DISEASE OF THE HIP-JOINT

is very common, very important, and presents some peculiar features.

It is a truly scrofulous disease, and occurs almost always before the age of puberty. In children, the morbid action usually begins in the bones, but it may originate in the cartilages, synovial membrane, or ligaments. In any case, the course and history of the disease is much the same.

It is often excited by very slight accidents—*e.g.*, a fall or a twist. Frequently it arises without any assignable cause.

Symptoms.—The earliest of these are trifling and intermittent pain, perhaps referred to the knee; slight lameness when the patient is tired; inability to stand upon the affected limb; some puffiness about the hip, and perhaps also about the knee; the buttock is flattened from disuse of the glutei muscles; the knee of the affected side points across the sound one; the foot is inverted; the thigh is adducted, slightly flexed on the pelvis, and cannot be extended without giving pain. If the patient is laid flat on his back the thigh rises, and if the thigh is laid flat the back rises—that is to say, there is some loss of movement at the hip-joint. If the trochanter is struck, or if the leg is jerked upwards, there is acute pain in the joint. The limb should be carefully measured and compared with its fellow. At first, it is sometimes slightly lengthened from effusion into the capsule; subsequently, it is *apparently* considerably lengthened by the obliquity which the patient habitually, and almost involuntarily, gives to his pelvis. In order to take the weight of his body off the diseased joint, he "stands at ease;" he bears upon the sound limb, throws out the sound hip, and lowers the pelvis on the affected side. In the later stage there is often shortening from absorption or dislocation. The joint becomes uniformly swollen, the tissues thickened, the skin distended, glazed, and doughy to the touch. If suppuration takes place, an indistinct fluctuation may be felt; abscesses may point above or below Poupart's ligament, or in the neighbourhood of the trochanter, or in the gluteal region; and sinuses may be left, communicating with the joint in various directions.

Treatment.—The joint should have *perfect rest* on a splint. If the case is in an early stage, the limb should be extended, and fixed by means of a long splint. In young children, it is an excellent plan to lay a sand pillow on each side of the body, and a short one between the legs, and stretch a sheet tightly over them; or a weight, to be gradually increased, may be affixed round the ankle, and hung over the end of the bed. Sayre of New York has devised a useful apparatus whereby the limb may be kept straight, and extension made, without the necessity of confing the patient to bed.

If there is acute inflammation in the early stage, leeches may be required. Counter-irritation by blisters, issues, setons, &c., is extremely useful when the disease threatens to become chronic. If an abscess forms, it should be opened by a direct incision; in some cases, however, it may be thought preferable to make a valvular opening, or to draw off the pus by means of the aspirator.

The importance of hygienic conditions and constitutional treatment cannot be over-estimated. The patient should have plenty of sunlight and pure-air, if possible at the seaside; a liberal but regulated diet; and sufficient clothing. If he is able, he should move about on crutches, or be driven in a carriage. He should take alteratives—occasional doses of grey powder and rhubarb, for example—with cod-liver oil, or the preparations of iodine or of iron.

In cases where there has been long-standing suppuration, and where there are sinuous tracks leading to bare bone, the head of the femur may be excised with great advantage.

WOUNDS OF JOINTS

are known by the escape of synovia. They should never be probed; but the part should be secured by a splint, and kept perfectly at rest.

The prognosis depends upon the extent of the injury, the size of the joint, and the constitution of the patient.

Treatment.—If the wound is small, it should be at once closed, and ice continuously applied to the joint. If it is larger, suppuration is likely to occur. In such a case the antiseptic treatment ought to be thoroughly carried out, and every local and constitutional means should be employed for allaying the inflammation. If one of the large joints, particularly the knee, is freely opened, excision or amputation may have to be performed.

DISLOCATION

signifies the misplacement of the bones, entering into the composition of a joint. The distal bone is said to be dislocated from the proximal.

Dislocation may be *partial* or *complete*. The articular surfaces may be entirely displaced, as in dislocation of the hip; or they may be partially displaced, as we sometimes see in dislocation of the knee. Again, the dislocation may be *simple*, or it may be *compound*, communicating with the outer air by means of a wound in the skin. Again, it may be complicated with fracture, or with ruptured vessels.

Dislocation is most common during adult life. In the young and old the bones are more apt to break. It also occurs more often in men than in women.

Like fracture, it may be caused either by direct violence or by muscular action. The lower jaw and the patella are not unfrequently dislocated in the latter way.

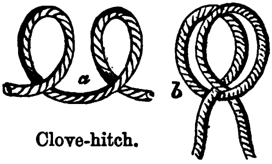
The *signs* of dislocation are, distortion of the limb or part, loss of power, immobility, and an irregular and unnatural outline of the joint. In some cases there is lengthening, in others shortening.

Dislocation is of necessity attended by the rupture of the capsule of the joint or of the ligaments, and laceration of the soft tissues. Though, in all ordinary cases, these injuries are subcutaneous, and hidden from view, yet they must not on that account be overlooked.

Treatment.—Dislocation should be reduced as early as possible. The aim of all treatment is to bring the articular surfaces into such a position, that the muscles may be able to restore them to their proper places.

The great difficulty is to overcome the contraction of the muscles. In the simpler cases, this may be done by mere manipulation, or by gradual extension, either by manual power or by means of pulleys. In order to obtain a firm purchase upon the part without unduly constricting it, it is customary to apply the extending force by means of a "clove-hitch." There are various ways of making this knot; perhaps the simplest is that which is here represented. The surgeon takes the cord or bandage, and casts a loop upon it. This he fixes with his left

Fig. 70.



Clove-hitch.

hand; then with his right he casts a second loop exactly like the first (Fig. 70 *a*), and this he passes across so as to bring it above the first loop (Fig. 70 *b*).

In more severe cases of dislocation, it will be necessary to relax the muscles by putting the patient under the influence of chloroform.

A second difficulty arises from the shape of the articulation itself: thus the margins of the acetabulum present an obstacle, which has to be surmounted before the head of the femur can be restored to its socket. This difficulty must be overcome by bearing in mind the relation of the parts, and applying force accordingly.

If a dislocation is left unreduced, the old socket is gradually filled up or absorbed, and a new one is formed, lined with a layer of fine dense tissue, like ivory or porcelain. Fresh ligaments supply the place of the old, and in time the patient gets a very useful joint.

Compound dislocation is a most severe injury, and one which calls for great judgment on the part of the surgeon. If it is one of the larger joints which is affected, and the patient is old or debilitated, amputation may have to be performed; but if the patient is young and in good health, an attempt may, perhaps, be made to reduce the dislocation and to save the limb.

A compound dislocation of one of the smaller joints must be reduced, and then treated on the same principles as a compound fracture.

Dislocation may be distinguished from fracture by attention to the following points:—1. The absence of crepitus. 2. The dislocated part is unusually fixed and immovable; whereas in a fracture there is unnatural mobility. 3. A fractured bone may be easily replaced, but there is great difficulty in keeping it in position; whereas when a dislocation is once reduced it remains in place. 4. A broken bone is generally shortened, but a dislocated one is unaltered in length.

When fracture and dislocation co-exist, the rule is to put up the fracture firmly in splints, and then reduce the dislocation. If the dislocation is left till the fracture has united, it will probably be found impossible to reduce it.

DISLOCATION OF THE LOWER JAW.

The lower jaw is occasionally dislocated by direct violence, but more frequently by muscular action—by the sudden and spasmodic action of the external pterygoid, at the moment when the mouth is wide open in yawning, laughing, &c. The condyle is drawn forwards into the zygomatic fossa. This may occur on one side only, or on both.

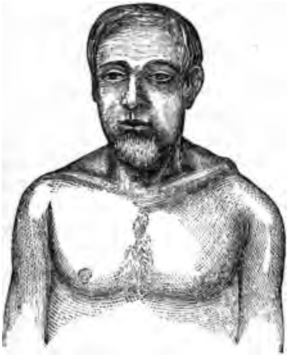
Signs.—The chin is protruded, the mouth is open, speech and deglutition are very imperfect, saliva flows from the mouth, and the condyle can be felt under the zygomatic arch. When one side only is affected, the signs are less distinct. The chin is then pointed to the sound side.

Reduction.—Our aim is to direct the condyle downwards and backwards. With this view, the surgeon protects his thumbs with a napkin, and then introduces them on the inside of the molar teeth on both sides. By this means he is able to lay firm hold of the angles of the jaw which he bears downwards and backwards, at the same time that he raises the point of the chin with his fingers. After the dislocation has been reduced, the patient should wear a four-tailed bandage upon the chin for a sufficient time to prevent recurrence (see p. 130).

DISLOCATION OF THE CLAVICLE.

The sternal end of the clavicle may be displaced either forwards or backwards, in front of the sternum or behind it.

Fig. 71.



Dislocation of the scapula.

The *treatment* consists in making extension by putting a pad in the axilla, or by drawing the shoulders back, as in fracture, and then keeping the end of the bone in its place by a suitable arrangement of pads and bandages.

The *outer end* of the bone is generally dislocated upwards, on to the acromion. Sometimes the bones are merely separated without any over-riding. In these cases, as it is the acromion which is forced away from the clavicle, it seems more in harmony with the general rule to speak of the injury as *dislocation of the scapula.* Fig. 71 represents such a case, the particulars of which I have reported in the *Lancet* for June 28, 1873.

The *treatment* must be conducted on the same principles as in the preceding case.

Although it is easy to reduce a dislocation of the clavicle, it is extremely difficult to keep the bone in its proper place. Indeed, it is probable that some slight amount of deformity will always be left after this accident.

DISLOCATIONS OF THE SHOULDER

are more frequent than those of any other joint. This arises from the shallowness of the glenoid cavity, the size and shape of the head of the humerus, the extent of its movements, and the position of the joint, which is not only much exposed to direct violence, but has also to bear the shock of falls on the hand.

The shoulder is liable to four dislocations:—(1) *downwards, into the axilla;* (2) *forwards, beneath the clavicle;* (3) *backwards, on to the dorsum of the scapula;* (4) *a partial dislocation forwards,* where the head of the bone rests on the edge of the glenoid cavity and the coracoid process.

Signs.—Whatever may be the precise nature of the injury, there is pain, loss of power, and immobility; the shoulder has lost its roundness, and looks angular; the acromion projects, and there is a marked depression below it; the head of the bone may be felt in an unnatural situation.

But besides these signs which are common to all the varieties, each has its own peculiar marks.

In the *first* variety, the head of the humerus may be felt in the axilla, the arm is lengthened, the elbow points outwards, and there is numbness from pressure on the axillary plexus of nerves. This dislocation is the most common of all.

In the *second*, the head of the humerus may be both seen and felt below the clavicle, the arm is shortened, and the elbow points outwards and backwards.

In the *third*, the head of the humerus may be felt on the dorsum of the scapula, and the elbow points forwards.

In the *fourth*, the head of the humerus may be seen and felt under the coracoid process.

Reduction of dislocation downwards into the axilla.—There are two methods of treating this dislocation. The one consists in making extension by drawing the arm *downwards* and *outwards*, the other in making extension by drawing the arm *upwards*.

If the *first* method is adopted, the patient should be stripped, and laid flat upon a couch. If need be, he should be placed under the influence of chloroform. The surgeon having taken off his boot, seats himself on the margin of the couch, facing his patient, and having grasped the dislocated limb at the wrist with both his hands, he places his near foot in the arm-pit, so that the hollow of the foot fits into the fold of the axilla. He then draws the arm slowly downwards and inwards, at the same time that he presses steadily with his foot.

If more force is required, a jack-towel may be fastened round the arm above the elbow by means of the "clove-hitch," so that an assistant may draw upon it; or the pulleys may be applied.

The same principle of reduction may be carried out, by seating the patient in a chair, the surgeon standing beside him, and placing his knee in the axilla, while he bends the arm over it; or the back of the chair, well padded, may be used as the fulcrum, and the head of the bone raised into its place by using the humerus as a lever.

The *second* method of treatment is by drawing the arm upwards. The patient is laid flat on his back, the shoulder is fixed by the hand of the operator, or by a jack-towel thrown round it, the arm is raised by the side of the head, and traction is made either by manual or mechanical force, until the head of the bone is lifted into its socket.

After reduction, a pad should be placed in the axilla, the upper arm bandaged to the side, and the fore-arm carried in a sling for two or three weeks, or for a sufficient length of time to prevent the joint from (as it were) forming a habit of becoming dislocated by very slight accidents.

The other varieties of dislocation at the shoulder-joint may be reduced by extension downwards; though, in each case, the direction of the extending force will have to be slightly modified to suit the particular position of the bones.

After the lapse of three months, it is almost hopeless to attempt the reduction of a dislocated shoulder. If the patient has begun to move his arm, and a false joint has been already in some measure established, the surgeon had better not interfere. The most serious, and even fatal, consequences may follow an injudicious attempt at reduction.

DISLOCATIONS OF THE ELBOW

are commonly the result of great violence. They are, therefore, likely to be attended with much inflammation, and are often associated with fracture.

They may be considered under three heads:—(1) the dislocation of both bones; (2) those of the ulna alone; (3) those of the radius alone.

(1) Both bones may be displaced either *backwards* or *forwards*. In the former case, the coronoid process is very likely to be broken; and, in the latter, the olecranon. In both cases the

diagnosis must be established by a careful comparison of the relative situation of the bony points in the two arms. If there is much swelling, it is often extremely difficult to determine accurately the nature of the injury.

(2) The ulna may be dislocated *backwards*. When this happens the point of the olecranon projects unnaturally, and there is a hollow above it. The elbow is fixed at a right angle. That the radius is not implicated may be ascertained by pronation and supination. Here, too, the coronoid process is very liable to be broken.

(3) The only dislocation of the radius which we need mention is the dislocation *forwards* on to the external condyle, though it is occasionally dislocated backwards, and sometimes outwards.

Reduction.—If the ulna is dislocated with fracture of either of its processes, it will be easy by extension or by flexion to restore the bones to their proper position, though it may be very difficult to keep them *in situ*. But if the ulna is dislocated without fracture, reduction will be a more difficult matter. It may, however, be effected by bending the elbow across the surgeon's knee, which he uses as a fulcrum. In the dislocation of the radius, the arm should be extended, while the head of the bone is pressed down into its place.

After reduction, the arm should be fixed upon an angular splint and carried in a sling.

DISLOCATION OF THE WRIST

is extremely rare. It must be carefully distinguished from fracture of the lower end of the radius (Colles's). The *treatment* consists in extending the joint, and then applying a flat splint.

DISLOCATIONS OF THE HAND.

The metacarpal bone of the thumb, and the phalanges of the thumb or of the fingers, are sometimes dislocated. These accidents are, however, rare, owing to the strength of the lateral ligaments.

The *treatment* consists in making extension by means of a tape, or narrow bandage, fastened to the finger by the "clove-hitch," and then securing the finger upon a splint. In some cases it has been found necessary to divide the lateral ligaments subcutaneously before reduction could be effected.

DISLOCATIONS OF THE HIP

are four in number:—

(1) Dislocation upwards, on to the dorsum ilii.

(2) Dislocation downwards, into the obturator foramen.
(3) Dislocation forwards, on to the pubes.
(4) Dislocation backwards, into the sciatic notch.

1. *Dislocation upwards, on to the dorsum ilii.*—This is the most common of all. The head of the femur rests on the smooth surface immediately above and behind the acetabulum. In this situation it forms a prominence which may be felt, especially on rotating the limb. There is loss of power, and distinct shortening. The thigh is slightly flexed on the pelvis, and the leg on the thigh. The knee points towards its fellow of the opposite side, and the foot is turned inwards.

Reduction.—The patient should be anæsthetized, and laid on his back on a mattress, placed on the floor. The pelvis should be fixed by means of a jack-towel, passed under the perineum, and fastened to a staple in the floor. A belt should be attached to the lower part of the femur, and connected with the pulleys. The extending force should then be applied slowly and gradually in the direction of the axis of the limb, until the resistance of the muscles is overcome. At the same time, the leg should be rotated outwards, or manipulated in such a way as shall facilitate the object in view. In some cases it may be necessary to pass another towel between the thighs, so as to abduct the upper part of the femur, and lift the head of the bone over the edge of the acetabulum.

After reduction, the patient should be confined to bed for a fortnight; a long splint should be applied to his leg in the usual way, and secured by an additional bandage round the hips.

After eight weeks have elapsed it is almost hopeless to attempt the reduction of a dislocated hip.

2. *Dislocation downwards, into the obturator foramen,* is marked by lengthening. The leg is abducted. The toes point forwards, and sometimes a little outwards. The trunk is bent forwards, by the tension upon the psoas and iliacus muscles. The prominence of the trochanter is lost. The head of the bone may be felt in its new situation.

Reduction.—The pelvis is to be fixed by a belt passed round it, and secured by a staple on the opposite side of the trunk. The upper end of the femur is then to be abducted, by means of a towel passed round it, and connected with the pulleys. In this way, the bone is drawn directly outwards, until it reaches a point where the muscles are able to act upon it, and restore it to its place. At the same time, the knee should be adducted, drawn towards the mesial line, so as to use the femur as a lever, and help in raising the head of the thigh-bone.

3. *Dislocation forwards, on to the pubes.*—Here the promi-

nence of the trochanter is gone; the limb is shortened and abducted; the toes point outwards, and the head of the bone can be distinctly felt above Poupart's ligament.

Reduction.—The pelvis should be fixed by a perineal band, and then extension should be made downwards and backwards. Here, again, as in the first case, reduction may be facilitated by passing a towel round the upper part of the thigh, and lifting the head of the bone over the edge of the acetabulum.

4. *Dislocation backwards, into the sciatic notch,* presents much the same signs as the first form of dislocation, only they are not so well marked, because the head of the bone drops into the sciatic notch, instead of resting on the dorsum ilii. The direction of the limb, too, in this dislocation, is more oblique than in the former; the affected thigh points across the middle of the opposite one. The mode of reduction does not differ materially.

DISLOCATION OF THE PATELLA.

The patella is sometimes dislocated *outwards,* on to the outer side of the external condyle.

This accident is apt to occur from muscular violence in persons who are knock-kneed.

Signs.—The knee is extended or slightly bent. A depression may be felt in the front of the joint, while the patella can be detected in its new situation.

The *treatment* consists in relaxing the extensor muscles by flexing the thigh on the pelvis and raising the leg. Then, by means of a little manipulation, the bone may be restored to its proper place. After reduction, the patient should wear a bandage, or an elastic knee-cap, for a few weeks.

Occasionally the patella is displaced *inwards;* and in some rare instances, it is turned half round, so that its outer edge points forwards, and presents a sharp ridge under the skin. Mr. Bellamy has lately recorded a case of this kind. A young man, in jumping out of a cart, caught his foot on the rail, and fell. There was great deformity at the knee. The patella was dislocated on to its inner edge, with the articular surface turned outwards. By extreme extension under chloroform it was soon reduced, but synovitis followed. Ultimately the patient perfectly recovered. (*Brit. Med. Jour.,* Jan. 4, 1873.)

DISLOCATION OF THE SEMILUNAR CARTILAGES

sometimes occurs in consequence of a sudden and violent wrench. If the cartilage is compressed between the tibia and the femur, it gives rise to intense pain, and the patient is unable to stand, or to move his knee.

The *treatment* is unsatisfactory, and the case must often be left to nature. By rotating the tibia on its axis, the surgeon may sometimes succeed in restoring the parts to their proper positions.

DISLOCATIONS OF THE KNEE-JOINT

are the result of great violence, and are more often compound, or complicated, than simple. Nevertheless, the tibia may be displaced *backwards* or *forwards*, or to *either side*. These dislocations are generally incomplete, and accompanied by more or less rotation.

Reduction is made by flexing the thigh, fixing it in that position, and then making extension by drawing from the ankle. When this is done, and a little pressure used, the bones may, in most cases, be restored to their proper situations without difficulty.

Not unfrequently, the knee-joint is dislocated by disease. In these cases, the tibia is generally drawn backwards and upwards.

DISLOCATION OF THE ANKLE

consists in the separation of the astragalus, carrying with it the foot, from the bones of the leg. These injuries can hardly occur without fracture of one or both malleoli.

The foot may be displaced *backwards* or *forwards*, or to *either side*. The dislocation outwards, with fracture of the external malleolus, is the most common (see p. 160).

In all cases, *reduction* must be effected by drawing upon the foot until the bones are brought into their positions, and then fixing them by means of side-splints, or a M'Intyre's splint, as the case may require.

DISLOCATION OF THE ASTRAGALUS

may take place, either *forwards* or *backwards*. Of these displacements the former is the most common. The accident generally happens from the patient falling upon his foot, when it is in the extended position. The bone may usually be felt, either on the instep, or in the space between the tibia and the tendo-Achillis.

Reduction may sometimes be effected by simply drawing upon the foot. Sometimes division of the tendo-Achillis may be necessary.

Not unfrequently, it will be found impossible, after all, to bring the bone back to its place. In such a case, it may either be excised at once, or left to itself. If left to itself, it is most probable that the skin over it will slough, and then part of it may be removed with the saw or pliers, or else allowed to exfoliate.

Mr. Hancock has recently reported a case in which an excellent result was obtained by removing the bone at once, and treating the wound with a constant stream of carbolic acid lotion from a syphon bottle. (*Lancet*, January 20, 1872.)

But, in truth, the dislocations of the ankle and of the astragalus are much more often compound, or complicated, than simple. If bony points protrude through the skin, and cannot be reduced, they must be sawn off, as in the case of compound fractures. If the soft parts are extensively lacerated, or if the main vessels are torn, or if the age and habits of the patient are unfavourable, the case will probably require amputation.

Some authors speak of the leg as being dislocated from the foot. Strictly speaking, this is correct; for in the accidents which lead to dislocation of the ankle, or of the astragalus, the foot is the fixed point, and the leg is wrenched from it by the weight of the body. But it is more convenient to have one general rule applicable to the whole body, and to say that the distal part is dislocated from the proximal.

ARTERITIS.

Arteries are liable to become inflamed, and such inflammation may be either *limited* or *diffuse.*

Limited arteritis is probably excited by embolism, ligature, wounds, or other like causes. It is of the adhesive kind, and tends to the occlusion of the vessel.

Diffuse arteritis is a blood disease, closely allied to erysipelas.

Symptoms.—Local pain and tenderness, extending perhaps some distance along the artery, which feels hard and tense. The parts which it supplies may become cold and numb, and show signs of gangrene.

The *treatment* must be conducted on the general principles which guide us in dealing with inflammation.

DEGENERATION OF ARTERIES.

There are two forms of degeneration to which arteries are chiefly liable—the *atheromatous* and the *calcareous.*

The atheromatous consists in the deposition of particles of granular matter, fat, and cholestrine upon the inner coat of the artery. This process gradually extends, until large irregular patches are formed. These patches have a yellow colour and a cheesy consistence. The middle coat becomes gradually involved in the degeneration.

Calcareous degeneration (ossification of arteries) consists in the deposit of earthy matter—carbonate and phosphate of lime—in the arterial coats. There may be only a few gritty particles, or the whole circumference of the tube may be rigid from the calcareous formation.

These two forms of degeneration are often associated in the same individual, and even in the same artery.

When the coats of an artery are affected with atheromatous or calcareous deposits, they are apt to give way; they lose that elasticity which plays an important part in carrying on the circulation, and the calibre of the vessel is diminished.

Thus it happens that the degeneration of arteries leads to many morbid conditions, which are fruitful sources of mortality, especially among elderly people. *Hinc subitæ mortes atque intestata senectus* (Juv. i. 144). To this cause we may trace many cases of aneurism, apoplexy, cerebral softening, senile gangrene, and disease of the heart. A man who has passed middle age should be careful to put no sudden or excessive strain upon his tissues. He should bear in mind that his arteries are not so elastic, his joints not so supple, his bones not so tough as once they were; and his activity should be moderated in accordance with his years. Taken in this sense there is much truth in the proverb to which Cicero alludes: "Be an old man betimes, if you wish to be an old man long" (De senectute, x.).

ANEURISM.

An aneurism is a tumour which is formed by the rupture or distension of the coats of an artery.

It is a disease of middle life, and more common in men than in women.

Whatever tends to impair the strength and elasticity of the arterial walls predisposes to aneurism. The principal exciting causes of the disease are blows, strains, and wounds.

There are various kinds of aneurism. The whole calibre of the artery may undergo gradual dilatation (*fusiform a.*), or the enlargement may be confined to a part (*sacculated a.*). Again, one or more of the arterial coats may remain stretched over the tumour (*true a.*), or all the coats may have given way (*false a.*). Again, when all the coats have been ruptured, the blood may be confined in a sac formed of cellular tissue (*circumscribed a.*), or it may spread up and down the part (*diffuse a.*).

If the blood makes its way between the arterial tunics themselves, it is called a *dissecting aneurism.*

True aneurisms are generally formed by the rupture of the two internal coats, and the dilatation of the outer. False aneurisms are often the result of punctured wounds.

The interior of the sac is composed of concentric layers of fibrine, of which the oldest are the whitest, and the most condensed. The inner ones are darker in colour, and more loosely compacted.

Symptoms.—When an aneurism presents itself externally, there is a circumscribed tumour situated in the line of some artery. It is tense, but may be emptied by pressing on the vessel above it. It pulsates, and expands with each beat of the heart. This expansive pulsation is very characteristic. When it is handled, it often communicates a *thrill* to the fingers. With the stethoscope a distinct *bruit* can be heard. When the circulation is arrested, the pulsation and *bruit* both cease, and return again as soon as the current is re-established.

Aneurism of the lower part of the abdominal aorta, or of the pelvic arteries, though it presents no external tumour, may be felt through the parietes. Aneurism of the upper part of the abdominal aorta, and of the intra-thoracic arteries, falls chiefly under the care of the physician.

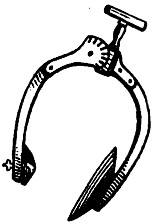
If left to itself, an aneurism usually goes on increasing, and as it increases, its pressure causes absorption of everything that comes in its way, hard and soft tissues alike. At length it reaches a free surface—the skin, or a mucous or serous membrane—ulceration takes place, and an opening is formed, through which the blood flows more or less quickly, and leads to a fatal result. Or, if it is situated in the extremities, the aneurism may burst, and the blood may become diffused through the cellular tissue of the limb; or the sac may become acutely inflamed and suppurate; or the disease may destroy life by its secondary effects, by pressure upon some important part, as the trachea or œsophagus.

In a few fortunate cases, aneurisms have undergone a spontaneous cure. This may happen from coagulation and consolidation of the contents of the sac, or from plugging of the aperture in the arterial wall, or from compression of the artery by the tumour itself.

Treatment.—The first thing to be done is to put the patient upon a regulated diet, to allay irritability and excitement, and to quiet the pulsations of the heart.

Of the surgical means of treatment, *pressure* is the simplest and safest. Our object is to arrest, or to diminish the flow of blood, so as to allow the contents of the aneurismal cavity to coagulate and solidify. This has been accomplished, in the case of poplitcal aneurism, by merely flexing the knee-joint. But it is not every case that can be treated in this simple way. More than this will generally be required. In most cases a tourniquet of some kind will have to be applied to the artery above the tumour. The most convenient are Signoroni's, or Carte's. Sometimes the fingers of an assistant answer better than anything. The pressure need not be constant, nor need it always be applied on the same spot. It may be shifted a little up and down the artery; and if it is exerted for twelve or fifteen hours out of the twenty-four, that will generally be found quite sufficient.

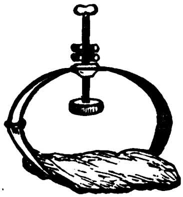
Fig. 72.



Signoroni's tourniquet.

Signoroni's tourniquet is shaped like a horseshoe (fig. 72), and consists of two limbs which are jointed together at the convexity, and which can be separated or approximated by a screw and cog-wheel. At one extremity of the horseshoe is a convex pad which is intended to be placed over the artery, and at the other extremity is a large concave pad which forms the point of counter-pressure. This tourniquet has the advantage of only making pressure upon two points, and leaving the rest of the limb free; but on the other hand it has the disadvantage of being liable to slip, and shift its position, under the movements of the patient.

Fig. 73.



Carte's tourniquet.

Carte's tourniquet has been variously modified, but it consists essentially of a broad ring which passes round the thigh, and gives support to an upright screw. This screw carries a pad upon its lower end, and is fitted with an elastic apparatus which moderates the pressure. (Fig. 73.) The advantages of Carte's tourniquet are that the point of pressure can be regulated with great nicety, and the force has a certain degree of elasticity.

Carte's and Signoroni's tourniquets are sometimes used together, or in pairs—the two instruments being placed side by side at a short distance from one another, so that pressure may be made first by one and then by the other. In this way the patient is saved some pain, and the danger of chafing the skin is avoided. When the application of the tourniquet has to be left to unskilled hands, it is a good plan to mark out the course of the artery with ink, or with a solution of lunar caustic, so as to be sure that the pressure is always exerted in the proper line.

Dr. Wm. Murray, of Newcastle, to whom is due the brilliant achievement of curing abdominal aneurism by pressure, recommends that the flow of blood should be as completely arrested as possible until coagulation seems to have taken place, and that then the patient should have complete repose ("The Rapid Cure of Aneurism by Pressure," 1871). Of late years appliances have been introduced under the name of compressors, or clamps, for the purpose of arresting the flow of blood through the aorta in the case of abdominal aneurism. Such instruments are for the most part modifications of Signoroni's and Carte's tourniquets on an enlarged scale.

If pressure cannot be used, or if it has been tried without success, we must have recourse to the ligature. The artery may be tied either on the proximal or on the distal side of the tumour. As a general rule the proximal side is preferred; and it is only in exceptional cases that the surgeon selects the distal side (Brasdor's operation). The ligature may be applied at any point between the aneurism and the next large branch; but it should not be placed too near the tumour on the one hand, nor too near the branch on the other.

The ligature should be of fine whipcord, or of catgut. It should be introduced with as little disturbance as possible, and should include nothing but the artery. It is to be drawn tight, so as to rupture the two inner coats of the vessel, for it is upon this that the process of cure, and the safety of the patient, depend.

After the operation, the limb should be kept warm. If unhappily gangrene supervenes, amputation will have to be performed at, or above, the point of ligature.

Other methods of treating aneurism have been practised, varying with the situation and nature of the tumour. The sac has been laid open, and both ends of the artery ligatured, for example, in dealing with a gluteal aneurism. Again, the surfaces of the sac have been rubbed together, in the hope of detaching some flakes of fibrine which might obstruct the artery on its distal side (Fergusson's method of manipulation). Again, galvanopuncture and acupressure are among the most recent suggestions.

ANEURISM BY ANASTOMOSIS (NÆVUS)

is a tumour formed by the dilated condition of the arterial or venous capillaries, or of both together. When arterial, it is bright red, tense, and pulsating. When venous, it is soft, and of a blue or purple colour.

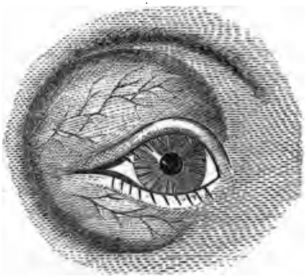
It is generally seen about the face, head, or neck, and its common seat is the skin, or subcutaneous cellular tissue. It is almost always congenital—"a mother's mark."

It may vary in size from a mere speck to a large irregular patch. Sometimes it remains stationary. At other times, it increases rapidly. When it is situated in the cellular tissue, the diagnosis is not always easy.

The arterial nævus, if left to itself, will sometimes undergo a spontaneous cure.

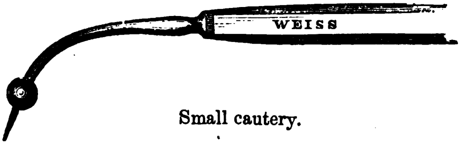
The *treatment* varies with the situation, size, and character of the nævus. Sometimes it may be destroyed by caustics—nitric acid, for example. Sometimes adhesive inflammation may be excited in it by pressure. Sometimes suppurative inflammation may be set up by setons; sometimes the blood may be coagulated by the injection of the tincture of the perchloride of iron. To introduce threads dipped in this tincture is the best way of dealing with a nævus on the eyelids. An orbital nævus, such as that represented in Fig. 74, should be treated with the small cautery delineated in Fig. 75. The bulb of the instrument is heated by a spirit lamp, and then the point is pushed into the affected part. This is done as often as the surgeon thinks necessary, and, after the lapse of a few days, the operation is repeated, until the nævus gradually contracts and becomes obliterated. But the most convenient way of dealing with a nævus, and that which is applicable to the great majority of cases, is the ligature. A strong silk thread is passed beneath and around the disease, and

Fig. 74.



Orbital nævus.

Fig. 75.



Small cautery.

tied in such a manner as to strangulate it. This may be done subcutaneously; and much ingenuity has been expended in devising knots that are suitable to different cases. Sometimes the blood supply may be cut off by acupressure applied to the main feeders, as in a case recently reported by Mr. Bellamy, in which an extensive nævus of the face was entirely cured by obliterating the facial, coronary, and angular arteries by acupressure; or, finally, excision may be practised; but this is a hazardous operation, and offers no special advantage. Of all these methods of treatment, the ligature is that which will generally be found the safest and best.

PHLEBITIS.

Veins are liable to inflammation, and such inflammation may be either *circumscribed* or *diffuse.*

When circumscribed, it may be of the adhesive or of the suppurative kind. When diffuse, it is of an erysipelatous nature.

Inflammation of veins is generally the consequence of wounds, in persons who are out of health. It may, however, arise spontaneously. Externally, the vein appears red and swollen. Lymph is effused on the internal surface. Upon this the blood becomes coagulated, and the vein is plugged up. Here the inflammation may begin to subside, and go no further than adhesion. Or, on the other hand, it may run on to suppuration. The lymph and coagulum form a boundary wall, preventing the pus from entering the circulation.

When the inflammation is of the diffuse or erysipelatous kind, no boundary wall is formed, the exudation is unhealthy, and there is great danger of purulent infection. The symptoms are of a low, typhoid nature, like those of pyæmia.

Treatment.—In the adhesive form of phlebitis, the part should be well fomented, and leeches applied along the line of the vein. If matter forms, it should be let out at once.

At the same time, the antiphlogistic regimen should be carried out, and purgatives and salines administered. In the diffuse form of the disease, support and stimulants will probably be required from the first. (F. 30, 31, 86, 94.)

VARIX

signifies a tortuous and dilated condition of the veins. The coats become thickened, and the valves are insufficient for their purpose. The affected part feels heavy, and aches. When the disease is more advanced, there is swelling and œdema, with very severe pain.

This condition is rarely seen in the deep veins, but it is very common in the superficial. The veins of the leg, which have to support a long column of blood, are the ones which are most often affected. Sometimes the large trunks alone are dilated. Sometimes it is only the smaller ones which become varicose. Sometimes all are affected alike. The limb is apt to become swollen and congested. Then the skin gives way, and the result is a varicose ulcer. Sometimes the veins of the spermatic cord are affected (varicocele), and then the pain is of a dragging character; sometimes those of the rectum (hæmorrhoids), and this is accompanied with intolerable itching and smarting. Of these two diseases we shall speak at length hereafter.

Whatever impedes the venous circulation tends to cause varix—be it general debility, or a ligature, or the pressure of a tumour, or of the gravid uterus, or a fæcal accumulation, or anything else.

The *treatment* of varicose veins in the leg is both palliative and curative. The palliative treatment consists in sponging the part frequently with cold water, rubbing the leg from the ankle to the knee—*i.e.*, in the direction of the venous current—and supporting the veins by means of a bandage or an elastic stocking.

But if the veins give much annoyance, or if they are liable to bleed, or if they are associated with an obstinate ulcer, we may have recourse to the curative treatment, which consists in obliterating them altogether. This may be done in several ways. The simplest and best method is to pass a hare-lip pin under the vein, and then twist a thick silk firmly over it in the form of a figure-of-8. By this means the circulation is arrested, a coagulum of blood forms, and the vein is closed by adhesive inflammation. As many ligatures of this kind may be applied as the case requires. Some surgeons divide the vein between the needles, that the circulation through it may not afterwards become re-established. But this seems to be an unnecessary proceeding, and one which is not altogether unattended with danger. After this operation the patient should wear a bandage or an elastic stocking, to prevent other veins from becoming varicose.

INFLAMMATION OF THE LYMPHATICS.

The lymphatics are liable to inflammation. When this is spontaneous, it is generally of the diffuse, erysipelatous kind. But much more often it arises from the irritation of a scratch or wound, in an unhealthy subject. The lymphatics become red, tense, and swollen; while the lymphatic glands become enlarged and tender. This is accompanied with a good deal of constitutional disturbance and prostration. The disease often leads to erysipelas, or to suppuration in the affected glands.

The *treatment* should include purgatives and salines, together with a strict diet. The affected limb should be raised, and constantly fomented. If matter forms, it should be let out at once.

INFLAMMATION OF THE LYMPHATIC GLANDS

(*Adenitis*).—The lymphatic glands not unfrequently become inflamed, without apparent inflammation of the lymphatics themselves. This is due to the absorption of unhealthy matter, or to over-exertion, or to some other source of irritation. In young persons of a strumous habit, it is common to see the glands in the neck enlarged in consequence of carious teeth, or a sore throat, or an eruption on the scalp. But it is the poison of syphilis or gonorrhœa, acting upon the glands in the groin, which supplies the most frequent examples of adenitis.

The inflammation may be either acute or chronic. When acute, the gland becomes rapidly swollen; there is pain and tenderness, the skin is red and hot, and suppuration soon takes place. When the inflammation is of a more chronic kind, the gland enlarges gradually without much pain. It is hard and callous to the touch, and if suppuration occurs at all, it is long delayed. The chronic enlargements, which are so common in strumous children, probably depend upon the deposition of tuberculous matter in the substance of the gland.

Treatment.—When a gland is acutely inflamed, it must be treated as an acute abscess, by leeches, fomentations, an early incision, and poultices. If sinuses remain, they will require to be dressed with stimulating lotions (F. 9, 11, 22, 24), and kept at rest by pads and bandages.

When the inflammation is chronic, it is of great importance to improve the general health, especially where there is a strumous taint. Locally, the disease should be treated with iodine liniment, or with the ointment of the iodide of lead, or of the red iodide of mercury. Extirpation is a remedy which should be undertaken with very great caution. It is apt to lead to a manifestation of the disease elsewhere, perhaps in some more vital part, such as the lungs or the mesenteric glands.

CANCER OF THE LYMPHATIC GLANDS.

The lymphatic glands are sometimes affected with cancer Primary cancer is rare in this situation, and is generally of th epithelial variety; but secondary cancer is common, especially of the medullary kind.

NEURALGIA

is an acute pain specially affecting the nerves. It is not continuous, but intermittent. The paroxysms vary greatly in severity, and in duration. The pain is always in the same situation, following the course of some large nerve or its branches. It generally affects the nerves of the head, especially the divisions of the fifth pair. It is also met with in the limbs and trunk, and sometimes it attacks the joints.

The causes of neuralgia are infinitely various, but they may all be summed up under two heads—(1) local irritation, (2) defective nutrition.

Local irritation includes carious teeth, spiculæ of bone, uterine disorder, worms, &c.

Defective nutrition embraces such causes as anæmia, chlorosis, malaria, &c.

The diagnosis must be established, first, by a careful examination of the whole course of the nerve, to see whether there is any local cause of irritation; and, secondly, by an inquiry into the general state of the patient's health.

Treatment.—If there is local irritation we must endeavour to remove it. If it is the general health which is at fault, we must try and improve it by appropriate means. A change of air, a more generous diet, and tepid or cold sponging are often of great use. At the same time some of the preparations of iron or of quinine should be prescribed (F. 41, 55, 56).

CONCUSSION OF THE BRAIN

signifies the state of nervous depression which is produced by a sudden blow on the head. The degree of such depression, or shock, varies extremely. Sometimes it is slight and transitory; at other times it is deep and prolonged. Not unfrequently it even proves fatal, either immediately, by arresting the action of the heart; or after a time, by leading to its gradual failure and decline. In either case, the fatal termination takes place by *syncope*, death beginning at the *heart*.

The *signs* of a severe concussion are these. The patient lies motionless and insensible—he is stunned. The surface of the body is pale and cold; the voluntary muscles and sphincters are relaxed; the pulse is weak and intermittent; the respiration is slow and sighing; as a rule, the pupils are contracted, but sometimes they are dilated, and occasionally there is squinting.

If the eyes are insensible to light, and if the legs cannot be excited to reflex movements, the prognosis is very unfavourable. Vomiting, on the other hand, is a good sign, and often ushers in the reaction.

Concussion of the brain may, as we have said, pass off in a few minutes, and leave no trace behind it, or it may lead to the speedy death of the patient.

But between these two extremes there are other effects which it may produce. The brain may be permanently injured, the intellect may be impaired, or the patient may become irritable and excitable. The special senses may become blunted—there may be amaurosis, or deafness, or loss of smell, or stammering; or there may be gradual failure of muscular power. Cases which follow any of these courses are apt to terminate suddenly from white softening, or disintegration of the brain substance.

The *treatment* of concussion of the brain aims (1) at restoring the natural functions, and (2) at preventing the reaction from going beyond its proper limits.

1. The patient should be laid in bed, well wrapped in blankets, and with his head rather low. A hot-water bottle should be applied to the feet, and the surface of the body be gently rubbed. No alcoholic stimulants should be given, except in cases of great depression.

2. When reaction has begun, we must endeavour to keep it from running on to inflammation. With this view, the patient should be confined to his bed, and freely purged. He should be restricted to a plain diet, and all sources of excitement or irritation should be carefully removed.

In the treatment of the after-effects, blisters, issues, setons, and even bloodletting may be required.

COMPRESSION OF THE BRAIN

may arise from various causes—*e.g.*, from depressed bone, from extravasated blood, from the exudation of lymph, from the lodgment of foreign bodies, from the formation of pus, or from morbid growths.

Signs.—The patient lies in a state of stupor and insensibility; sometimes he may with difficulty be aroused to answer questions. The skin is natural in colour, warm, and moist. The pupils are almost always dilated, and insensible to light; sometimes they are unequal. The pulse is slow and full. The face is often flushed. The breathing is regular, but stertorous, from paralysis of the velum palati, the cheeks being distended at each expiration. There is more or less paralysis of the voluntary muscles; sometimes the sphincter ani is similarly affected, giving rise to involuntary discharge of fæces; and sometimes the bladder, leading to engorgement, and overflow of urine. There is also a tendency to death by coma, compression of the medulla oblongata, and cessation of respiration; death beginning at the *lungs*.

In speaking of *concussion* and *compression*, it is necessary to describe typical examples. But in practice, the signs are often obscured, or the two states are merged into one another.

Treatment of Compression.—The patient's head should be shaved. If fracture exists, it must be dealt with according to the rules given elsewhere (see p. 127).

If there is no fracture, cold should be continuously applied, and the patient should be freely purged.

If the symptoms get worse, and death is imminent, the question of trephining may be considered. But it is often so difficult to ascertain the exact point of compression, that the cases in which we can resort to the trephine, with any hope of success, are extremely rare.

TRAUMATIC ENCEPHALITIS

signifies inflammation of the brain or its membranes, following injury to the head. It presents two types, which may conveniently be called the *acute* and the *chronic* forms of the disease.

In the *acute* variety, the symptoms come on early, perhaps in a couple of days, the reaction gradually running into inflammation. There is severe pain in the head, with nausea and vomiting, a quick and full pulse, a hot and flushed skin, restlessness, irritability; the mind is wandering and confused, and there is sometimes violent delirium. When suppuration takes place, there are rigors, followed perhaps by the signs of laceration and compression, such as squinting, stertor, coma, paralysis, twitchings, or convulsions.

The *treatment* should be antiphlogistic and sedative. Ice to the scalp, low diet, bleeding, blisters, purging and antimony (F. 34)—these are the means that we must rely upon. If pus has formed, and its situation can be discovered with any certainty, the trephine may be used.

In the *chronic* variety the symptoms do not make their appearance until some time, perhaps a few months, after the injury. It is apt to follow comparatively slight accidents, from which the patient thinks that he has completely recovered. There is generally, however, some symptom—loss of memory, impairment of the senses, irritability, persistent headache or the like—which indicates a permanent alteration in the brain-tissue. Suddenly an attack of inflammation is kindled, which runs much the same course as in the acute variety.

Where these signs of a permanent alteration in the substance of the brain are present, the patient should habitually live on an unstimulating diet; he should take an occasional purge, and avoid all mental or bodily excitement, which might determine an acute inflammation. If, however, such an attack takes place, the early treatment should be active, for in its later stages the case is almost hopeless.

CONTUSIONS OF THE SCALP

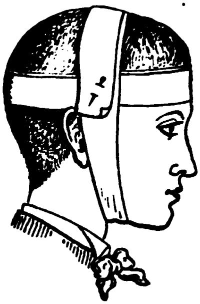
are sometimes followed by extravasation of blood, either beneath the muscular aponeurosis, or beneath the pericranium (cephalhæmatoma). Such collections of blood are not uncommon in new-born children, apparently as the result of compression of the skull during parturition.

When the centre of the tumour softens, while the edges remain hard, it is very apt to be mistaken for a depressed fracture.

Treatment.—In any case, the extravasated blood should be left to itself, or treated only with an evaporating lotion (F. 18); an incision should never be made to let it out.

Lotions, or other applications to the scalp, may conveniently be kept in position by a simple bandage, such as that represented in Fig. 76. The roller is first carried horizontally round the head, then pinned at the temple, and passed over the vertex in any direction that the case may require. If necessary, to prevent it from slipping, it may be further secured by a turn under the chin.

Fig. 76.

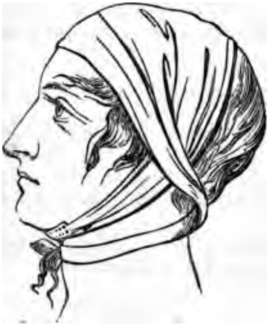


Bandage for the head.

SCALP WOUNDS

should be carefully cleansed, and then their edges accurately brought together, and fixed by strips of plaster, or, if need be, by silk, catgut, or wire sutures. Provided that the needle is not carried deeper than the scalp, there is no more danger in using sutures in this situation than in any other. Hæmorrhage may always be controlled by a pad and bandage. It is an axiom in surgery, that no part of the scalp ought ever to be removed, no matter how much it may be bruised, or how slender may be its attachments. It is most probable that, if it is replaced, it will retain its vitality. In wounds of the scalp there is always more or less danger of erysipelas, or of encephalitis. The patient should therefore take a purge, and restrict himself to rather a low diet for a few days. If there are indications of suppuration having taken place beneath the occipito-frontalis (phlegmonous erysipelas), an incision should be made at once quite down to the bone, and poultices or dressings should be applied, and retained by a four-tailed or a six-tailed bandage.

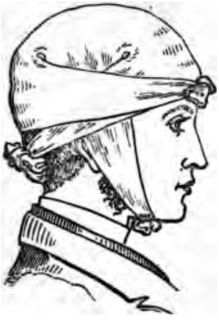
Fig. 77.



Four-tailed bandage.

Four-tailed bandage for the head.—This bandage consists of a strip of calico a yard long and six or eight inches broad, which is slit up the middle from both ends to within three inches of the centre. In this way a bandage is formed which has four tails of equal length and breadth, and a central area of about six inches square. This central portion is applied to the vertex in the required position, the two posterior tails are then brought forward, and fastened under the chin, while the two anterior ones are carried back below the occiput and tied; or they may be crossed in this situation, brought forward round the neck, and secured in front. (Fig. 77.)

Fig. 78.



Six-tailed bandage.

Six-tailed bandage for the head.—When a bandage is required which will cover a larger part of the head than the four-tailed, we have recourse to the six-tailed. This bandage is formed of a piece of calico a yard long and eight or ten inches broad, split from each end into three tails of equal breadth to within three inches of the centre. The central portion is laid upon the top of the head, the two middle tails are secured underneath the chin, the anterior tails are carried backward and tied at the nape of the neck, and then the posterior ones are brought forward horizontally round the head, and fastened over the brow. (Fig. 78.)

WOUNDS OF THE BRAIN

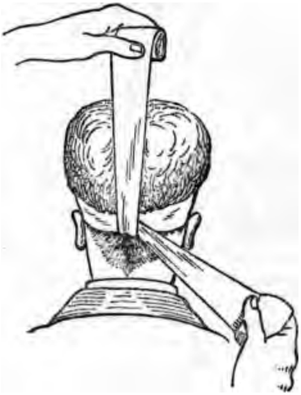
arise from various causes—depressed fracture, simple undepressed fracture or concussion with laceration, penetrating wounds, whether punctured or incised, &c.

The symptoms are those of concussion, compression, or inflammation. There are no special signs.

It makes a great difference what part of the brain substance is injured. If it is any of the central portions, death takes place rapidly. Children bear wounds of the brain better than adults; and those who labour with their hands better than those who work with their heads. I have already alluded to a remarkable case which occurred in my practice, and which illustrates these points (see p. 129).

Treatment.—The case should be left as much as possible to nature. If a foreign body is present in the wound it should be gently and cautiously removed. The general treatment should be antiphlogistic. The dressings should be of the simplest kind—*e.g.*, lint dipped in cold water. Slight and equable pressure should be maintained over the wound, to prevent protrusion of the substance of the brain (hernia cerebri). For this purpose the capitellum bandage will sometimes be found useful.

Fig. 79.

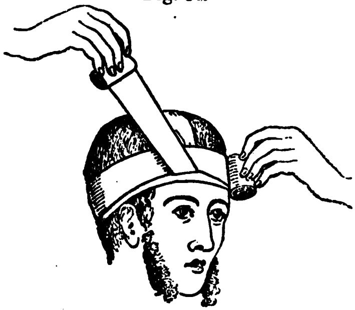


Capitellum (1).

The *capitellum*, or complete bandage for the head, requires a long double-headed roller, rather narrower than an arm-bandage. In practice it is found a convenient method to stitch two single-headed rollers together, and thus to form a long double-headed one.

The operator, standing behind his patient, places the centre of the bandage on the forehead, and conducts the rollers horizontally round the head, one to the right and the other to the left, as far as the occiput, that in the right hand being passed underneath the left and lying next the head. Care should be taken to place the bandage low down, both on the brow and on the occiput, so that it may get a good hold, and be prevented from slipping upwards. On reaching the occiput the bandage in the right hand is transferred to the left, and that in the left is transferred to the right. The bandage in the right hand is now pressed firmly against the head, and kept in that position so as to fix the under one; while that in the left is taken straight over the vertex to the brow in the median line. (Fig. 79.) The right hand bandage is now continued horizontally round the head over the right ear, until it arrives at the brow, where it meets the bandage in the left hand, and crosses in front of it. The rollers must now change hands again; that in the left hand, the horizontal one, is pressed firmly against the head, whilst that in the right is brought over the vertex, from before backwards, as far as the occiput, slightly overlapping the first fold, (Fig. 80), starting from the front a little to the right, and finishing at the occiput, a little to the same side of the median line. By arranging in this way the two folds, which are placed on either side of the central one, we are enabled to make them lie flat, and to adapt them to the shape of the head. The bandage in the left hand is now carried on horizontally round the head, over the left ear, to the occiput, where it passes over that in the right hand. The bandages are now made to change hands again; that in the right hand, the horizontal one, is firmly pressed against the head, whilst that in the left is taken over the vertex from behind forwards, as before. The bandage in the right hand is again carried round the head, over the right ear, as far as the forehead, in front of that in the left hand. The bandages are now again transferred from hand to hand; and that in the left hand is pressed firmly against the head, while that in the right is conducted directly over the head, from the brow to the occiput, a

Fig. 80.



Capitellum (2).

little to one side of the last fold. These steps are repeated as often as they are necessary, until the whole head has been covered; and then the bandages are carried once horizontally round the head, and fastened with pins, or tied in a knot.

SPINA BIFIDA

is the name given to a congenital malformation, wherein the spinous processes of the vertebræ are deficient, and the laminæ are open. The consequence is that the coverings of the cord yield to the pressure of the cerebro-spinal fluid, and a tumour is formed.

Spina bifida is generally met with at the lower part of the spine, in the lumbar and sacral vertebræ.

The tumour which is formed is in the mesial line, fluctuating, highly elastic when the patient is erect, but when he lies down it becomes soft and lax. It is usually about the size of an orange. Sometimes the skin is unaffected; at other times it is congested and blue.

If left to itself, it may ulcerate and burst, and then it is probable the patient will die of inflammation of the cord and its coverings; or it may give little or no annoyance, and the patient may grow up to adult life. But, in the great majority of instances, the patients die at an early age from convulsions, or paralysis, or from some other like cause.

The *treatment* consists in making equable pressure upon the tumour by means of a concave pad. If, notwithstanding, the disease goes on increasing, the sac may be punctured with a fine trochar, part of the contents let out, and pressure applied as before. This proceeding may be repeated from time to time, as the case requires. Dr. J. Morton, of Glasgow, recommends tapping the tumour, and injecting it with a solution of iodine in glycerine. (Brit. Med. Jour., April 6, 1871.)

LATERAL CURVATURE OF THE SPINE

frequently occurs in young persons, especially in girls, about the age of puberty. It sometimes depends upon rickets, but more frequently upon weakness and relaxation of the muscles and ligaments of the spine. The primary curve generally takes place in the dorsal region, and, if the disease advances, a second, or compensatory curve, usually manifests itself lower down, in the lumbar region.

Signs.—One shoulder is higher than the other. The corresponding side of the chest or back projects, the scapula "grows out." The pelvis is tilted in the opposite direction. On examination, it is found that the spine is curved; and, if the case is a bad one, the curve will be double, like the letter S.

Causes.—The predisposing cause is muscular debility. This is generally associated with an anæmic or bilious state of the health, at a time when the patient is growing rapidly.

The immediate cause is the excessive employment of one side of the body—as in standing on one leg, using one arm in needlework, writing, &c.

The intervertebral cartilages are unequally compressed, and, if this goes on continuously for a length of time, they do not recover themselves. A permanent alteration takes place in the outline of the spine, a slight curve is established, and to this the muscles and ligaments soon adapt themselves.

Treatment.—The first thing is to improve the general health by a careful, but nutritious, diet, by moderate exercise in the open air, and by tonic and alterative medicines.

The next object is to brace the relaxed muscles and ligaments of the spine. This may be done by cold sponging and friction. The back may be sponged every morning, and rubbed with a stimulating liniment every night—*e.g.*, the lin. ammoniæ, or the lin. sinapis, or the lin. camph. co.

The third indication is to relieve the spine of the weight which it has to support. With this view, the patient should not be allowed to stand or sit much. Once or twice during the day she should lie down on a flat sofa for an hour, either in the prone position or the supine.

If there is much deformity when the case is first seen, or if it continues to make progress, notwithstanding the employment of the means we have mentioned, the patient must wear a mechanical contrivance, to take the weight of the body off the spine, and to press the outgrowing part into its proper position.

A well-devised course of gymnastics may be of great use, not only in improving the condition of the muscles and ligaments, but also in counteracting any deformity which may have already arisen.

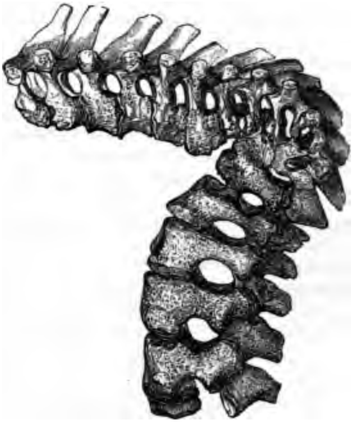
ANGULAR CURVATURE OF THE SPINE

is a disease of strumous origin, and, like the other manifestations of scrofula, it is more common in early than in adult life.

Inflammation takes place in the bodies of the vertebræ—perhaps as a consequence of the deposit of tubercle—the cancellous tissue softens and breaks down, giving rise internally to abscess, and externally to an angular projection of the spine.

The mid-dorsal region is that which is most apt to be affected: sometimes as many as five or six vertebræ, with their intervertebral discs, are involved in the disease. The measure of the angle will depend in each case upon the number of vertebræ which are implicated, and upon the extent to which the morbid action has advanced. In slight cases, the projection is hardly noticeable; in severe cases, it is sharp and prominent, as in Fig 81, which was drawn from a preparation in Charing Cross Hospital Museum.

Fig. 81.



Angular curvature of the spine.

Signs.—Weakness of the back, with slight local pain, which is aggravated on pressure. Perhaps the spines of the vertebræ are more prominent than they should be. These symptoms, coupled with the general indications of scrofula, are all that we have to enable us to form an early diagnosis; and such a diagnosis is here of great importance.

When the disease has advanced farther, there may be twitchings of the limbs, or partial paralysis; the pain is then more acute, particularly when the spine receives a smart blow, or is rudely shaken; and the deformity is greater.

When cases are submitted to treatment in the early stage, the destructive process may be arrested, the disintegrated tissue may be absorbed, anchylosis may take place between the bodies of the vertebræ, and nothing may remain but a slight projection of the spine.

In more severe cases, it is probable that an abscess will form (lumbar, psoas, or iliac abscess). If this happens, the patient is very likely to sink from exhaustion and hectic; or he may die at a much earlier stage of the disease, by implication of the spinal cord.

Treatment.—The first and most essential thing is to take the weight of the body off the spine. With this object, the patient should be confined strictly to the horizontal position, but should be allowed to adopt any posture that is most comfortable to himself. A mechanical couch, such as Alderman's, gives great relie in these cases.

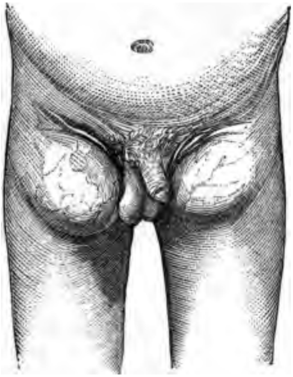
The next point is to improve the general health by fresh air, a careful, but nutritious, diet, and tonic and alterative medicines At the same time we must try to bring about a more healthy local action by counter-irritation with iodine, blisters, issues, &c.

LUMBAR, PSOAS, AND ILIAC ABSCESS.

When the tubercular matter softens, and the cancellous tissue breaks down, it often gives rise, as we have said, to abscess. Such abscesses attain a great size and extend in various directions, according to the situation of the disease.

Sometimes they make their way among the muscles of the back, and point in the loin (*lumbar a.*). Sometimes they travel down the spine, under the pillars of the diaphragm along the course of the aorta and external iliac artery and point above Poupart's ligament (*iliac a.*). An abscess which presents itself in this situation, is generally connected with disease in the upper dorsal region. When the disease is rather lowe down, in the lower dorsa or lumbar vertebræ, the abscess is guided by the sheath of the psoas muscle, and point

Fig. 82.



Double psoas abscess.

on the inside of the thigh, below Poupart's ligament (*psoas a.*). Fig. 82 was drawn from a patient who was recently in Charing Cross Hospital, under the care of Mr. Canton, and who had double psoas abscess, connected with disease of the lower dorsal vertebræ, of which he died.

Abscesses originating in disease of the spine may present themselves in various other situations; for example, in the pharynx, in the neck, in the front of the abdomen, or in the perineum. In each case, these abscesses will have to be distinguished from other collections of pus, arising independently of spinal disease.

Treatment.—When the abscess distinctly points, it may be opened by a small valvular incision, part of the contents let out, and the opening closed again. This may be done from time to time, as often as occasion requires. Until the abscess begins to involve the skin, and threatens to ulcerate, it should not be opened: the surgeon should content himself with ordering perfect rest, and improving the general health. If free suppuration and discharge once begin, fatal hectic is likely to be the result. On the other hand every surgeon has seen cases in which large collections of pus have gradually become absorbed, as the patient's health improved. Drawing off the pus by means of the aspirator may be beneficial in some instances. The advocates of the antiseptic method of dressing wounds open such abscesses freely, feeling confident that they can check the formation of pus.

INJURIES OF THE SPINAL CORD.

The spinal cord, like the brain, is liable to be *concussed, compressed*, or *wounded*. The vertebræ are sometimes *dislocated*. These injuries, however, are not very frequent; and when they do occur, they are often associated with fracture.

FRACTURE OF THE SPINE

may arise from direct violence, or from the spine being bent until it breaks—as, for example, in the act of falling.

The *symptoms* are partly *local*, such as belong to all fractures, and partly *nervous*, depending upon the nature and amount of injury which the cord has sustained.

The local symptoms are pain, loss of power, and an irregularity of the spine. Sometimes, the spinous processes are unnaturally far apart, with a gap between them; sometimes, one portion of the column is prominent, while another is depressed.

If the cord is so far compressed, or lacerated, that its functions are arrested, there will be loss of both motion and sensation below the point of injury. If the fracture is situated in the lumbar region, the lower part of the trunk, the genito-urinary organs, and the lower limbs will be paralysed, while the upper part of the body remains unaffected. In this state the patient may live for a few months; death taking place from exhaustion, consequent upon sloughing of the nates, or disease of the bladder, or an intercurrent inflammation.

If the injury is in the upper dorsal region, the intercostal muscles will be paralysed as well, and breathing will be carried on entirely by the diaphragm. Under these circumstances, the patient may perhaps live a week, dying ultimately with congestion of the lungs.

If the fracture traverses the lower cervical vertebræ, the upper extremity will share in the paralysis.

In all these cases the intellect remains clear and unaffected.

If the lesion is a little higher up, above the origin of the phrenic nerve, death takes place instantly from cessation of respiration.

Treatment.—When the fracture is in the lower dorsal or lumbar region, the patient's life may be prolonged, and much may be done to make it more tolerable. With this view, he should be laid on a water-bed, and kept perfectly clean. Everything should be done to prevent sloughing of the nates. An occasional purgative or enema should be given. As the urine is apt to become offensive and ammoniacal, it should be drawn off, and the bladder washed out twice a day; at the same time, perfect quietness and repose should be enforced.

When the injury is higher up, little can be done in the way of alleviation.

In rare cases, fracture may occur without serious consequences. The spinous processes alone may be broken off, or the cord may escape uninjured, even though the fissure traverses the laminæ, or the bodies of the vertebræ.

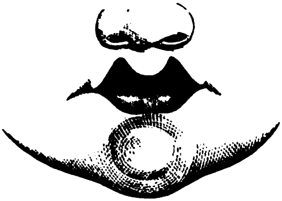
SALIVARY FISTULA.

Occasionally the duct of the parotid gland (Steno's duct) is wounded; or an abscess forms in its track, and bursts externally. In either case, a salivary fistula is likely to be the result. The secretion from the parotid, instead of making its way into the mouth, dribbles over the cheek.

The *treatment* consists in establishing an opening into the mouth by means of a few threads of silk, or a wire, or a piece of catgut, passed from without inwards, and tied in a loop through the mouth. The next point is to close the skin of the cheek over the fistulous opening. This may be done by touching the edges with the actual cautery so as to make them contract; or by paring the edges, and bringing them accurately together; or by dissecting the skin around the wound, and sliding it along so as to cover the opening. But, under any circumstances, salivary fistula is a difficult thing to cure.

HARE-LIP

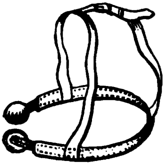
Fig. 83.



Double hare-lip.

signifies a congenital fissure, or fissures, in the upper lip. It is often associated with malformation of the superior maxillary, or inter-maxillary, bones; especially with cleft palate. When the fissure occurs on one side only, it is said to be *single*, when on both sides *double* (Fig. 83). When there is but one fissure, it is generally on the left side.

Fig. 84.



Hainsby's spring compressor.

The *treatment* of an ordinary case of single hare-lip is simple enough. It consists in dissecting the lip from the adjacent bone, paring the edges of the fissure, bringing them accurately together, and securing them by means of hare-lip pins, over which a thick silk is twisted in the form of a figure-of-8. The wound and the sutures should then be painted with collodion, to exclude the air, and promote union by adhesion. The spring compressor, devised by Mr. Hainsby, is a great assistance. It consists of a horseshoe spring, which passes horizontally round the back of the head, on a level with the upper lip, and which is supported by straps going over the vertex and occiput. (Fig. 84.) The spring is covered throughout with leather, and at each end it is furnished with small soft pads, which bear upon the cheeks, pushing the two sides of the lip together, and thus preventing tension. After the lapse of three or four days the pins may be withdrawn, and the scab allowed to fall off.

When the fissure is double, both sides may be operated on in a similar way either at the same time, or at an interval of a fortnight. The latter is probably the better plan.

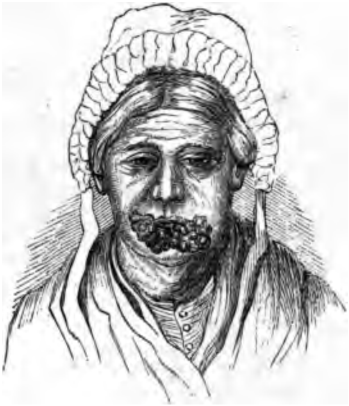
When the case is complicated with malformation of the bones, or protrusion, the surgeon will have to exercise his ingenuity in planning the operation.

The time at which the operation ought to be performed is an important question. It is now pretty well settled that it should be done at an early age—say at three months—unless special circumstances require delay.

EPITHELIOMA OF THE LIP

is a common disease, and one which is much more often seen in men than in women. It commences as a tubercle or a fissure, and may often be traced to some local irritation—for example, to the habitual use of a short clay pipe. The disease may remain for a long time in a state of abeyance; then, suddenly, the growth begins to enlarge, becomes painful, and ulcerates. A foul and offensive sore, with an indurated base, presents itself. Gradually it spreads, until it involves the whole lip. The glands underneath the jaw become enlarged, and the patient at length dies, worn out by the pain and irritation. Fig. 85 was drawn from an old woman who was lately a patient in Charing Cross Hospital. She had been in the habit of smoking for thirty years.

Fig. 85.



Epithelioma of the lower lip.

The *treatment* consists in early and free excision. If the disease is limited, a V-shaped incision may be sufficient to include it all. But, if it is more extensive, it will have to be removed by a semicircular cut. In such a case, it is but too probable that the disease will reappear in the course of a few months.

LUPUS

is the common name which is given to certain obstinate and intractable ulcers which sometimes attack the face. There are two varieties of lupus—1, *l. non-exedens;* and 2, *l. exedens.*

1. *Lupus non-exedens* (serpiginous ulceration of the face) begins generally on one ala of the nose, as a red, raised tubercle, which ulcerates, and spreads. It only affects the surface of the true skin, and never reaches the subcutaneous tissue. It may extend over a great part of the face—healing in one direction, while it goes on spreading in another. The ulcerative process goes on merely at the margins. The cicatrix which is left behind is hard and puckered; sometimes it is white and shining; sometimes red, congested, and irritable.

Young persons are particularly apt to be affected with serpiginous ulceration of the face. The disease often gives rise to great deformity, compressing the nose, or drawing down the eyelids.

The *treatment* consists in soothing the local disease while we endeavour to improve the general health. The patient should be instructed to wear a veil, and avoid exposure to wind and dust. Lint spread with a simple ointment, or a glycerine lotion, should be applied to soften the skin, and exclude the air. If the disease is spreading rapidly, the line of ulceration may be touched with nitric acid, or with the actual cautery. The patient should live on a plain but nutritious diet, and take arsenic, or cod-liver oil, or the preparations of iron, or iodide of potassium. (F. 41, 50.)

2. *Lupus exedens* (rodent ulcer) generally begins on the ala of the nose by a raised, red tubercle, which breaks, and gives rise to a foul and offensive ulcer. It spreads in every direction, invades all tissues alike, and at length forms a ghastly excavation in the centre of the face.

It is often associated with a syphilitic taint, but still more often with a strumous habit of body.

Treatment.—The first thing is to destroy the ulcerating surface by caustics. For this purpose, the actual cautery, or the acid nitrate of mercury is the best. The subsequent dressings should be composed of dry lint.

Our next aim is to improve the general health by nutritious diet, by cod-liver oil, steel, and alteratives. If there is a history of syphilis, the iodide of potassium should be given freely. (F. 41.)

The Diseases of the Eye next claim attention. I shall, however, only speak of the commoner and more superficial affections of the organ, such as are met with in general surgical practice, without alluding to those deeper diseases which are revealed by the ophthalmoscope.

OPHTHALMIA TARSI

(*Tinea ciliaris*). By this is meant an inflamed state of the margins of the lid. The disease seems to begin in the Meibomian follicles, and to spread thence to the adjacent palpebral conjunctiva, and to the edge of the lid. There is an unnatural, viscid secretion, which causes the eyelids to stick together during sleep, and forms a hard, dry crust around the roots of the lashes.

The eyelashes become stunted and irregular, giving rise to trichiasis, and the edges of the lids thickened and excoriated.

There is heat and irritation, with intolerance of light. The disease is generally accompanied by derangement of the digestive organs. Very often it co-exists with a scrofulous habit.

The term *lippitudo* is applied to the chronic stage of the disease, when the lashes have disappeared, and the margins of the lids are red, swollen, and everted, from thickening of the palpebral conjunctiva.

Treatment.—If the inflammation is acute, the eye should be assiduously fomented with water, or with a decoction of poppy-heads (F. 2), and the patient should take some mild aperient or alterative.

Subsequently, astringent or stimulating applications may be used with advantage—*e.g.*, lotions of alum, or of the sulphate of copper or of zinc (gr. j—ij ad ℥j).

The edges of the lids should be lightly touched at night with the zinc ointment, or with dilute citrine ointment (gr. x ad ʒj adipis). But before this is done any crusts that may have formed should be softened with warm water, and removed; otherwise the ointment does no good. It is an excellent plan to touch the sore or thickened parts about the roots of the lashes with a camel's-hair brush, which has been moistened and passed over a stick of lunar caustic. The lids should be well cleaned before the application is made, and carefully wiped with a soft sponge immediately afterwards. This may be repeated once a week.

HORDEOLUM,

or *stye*, is an inflammation of one of the ciliary follicles. A painful swelling forms on the margin of the lid. It may either suppurate, or remain for some time in an indurated condition, and then gradually subside. It indicates a disordered or enfeebled state of the health.

Treatment.—Fomentations or poultices should first be applied. When suppuration has taken place, it may be relieved by a puncture, and afterwards treated with a little stimulating ointment. The patient should take a purge, and then alteratives and tonics. His diet should be regulated, and if he can have a change of air, it will be of advantage to him.

In the indurated condition, the cold water douche, combined with the dilute citrine ointment, or the nitrate of silver applied with a camel's-hair pencil, will be found very useful.

ENCYSTED TUMOURS OF THE EYELIDS

(*Tarsal Cysts*).—Encysted tumours are often met with in the eyelids, especially in the upper. They appear to be produced in a Meibomian gland, which becomes dilated, and filled with sebaceous matter. They make their way, either outwards beneath the skin, or inwards, so as to present on the conjunctival surface. They may remain of small size for a length of time, and then slowly disappear. But, more frequently, they become inflamed, and increase rapidly, on some slight cause of irritation, such as dust, wind, cold, &c.

Treatment.—The cyst should be slit up from the conjunctival aspect, and its contents squeezed out, or turned out with a scoop made for the purpose. The point of a probe should be introduced from time to time to prevent the opening from healing too quickly. Sometimes the dilute citrine ointment, externally applied, seems to disperse these little tumours.

MOLLUSCUM CONTAGIOSUM

(*Glandiform Tumour*).—These tumours are found in the skin of the cheeks and nose, but more especially in that of the eyelids. They are very common among children. They are hard, painless, and white, varying in size from that of a pin's head to that of a horse-bean. They are composed of granular-looking matter, probably hypertrophied sebaceous gland-structure. They are seldom met with singly. They usually present a small orifice, through which a white fluid exudes. The disease is undoubtedly contagious, but upon what this depends is a moot point. It is tolerably certain that it is not upon a parasite. Perhaps (as Virchow suggests) the sebum from one patient finds its way into the follicles of another, and there produces a similar irritation and overgrowth.

The readiest *treatment* is to divide the tumour across, and press out the contents between the thumb nails. This proceeding seems rude, but it is effectual, and gives very little pain.

TRICHIASIS

is a perverted condition of the cilia, in which they have a tendency to grow inwards. It is a frequent result of ophthalmia tarsi. The whole line of lashes may be affected, or only a part of it. The eye becomes irritated, and its surface is kept in a chronic state of inflammation.

Treatment.—The disease may be palliated, by pulling out the offending hairs from time to time by means of a suitable pair of forceps. If this fails, the portion of skin containing the follicles of the faulty lashes may be dissected out. Sometimes the whole of both rows requires to be removed in this way.

ENTROPION

signifies an inversion of the lid. It is necessarily attended by trichiasis, and gives rise to great irritation. It may be the result of a cicatrix in the conjunctiva, or of a neglected attack of strumous, or purulent, ophthalmia. Or it may arise from other causes, such as relaxation of the skin of the lid, more especially of the lower. It not unfrequently follows operations upon the eye in elderly people. Cicatrices in the conjunctiva are very apt to result from the use of too powerful applications.

Treatment.—When the entropion is slight, it may be treated by contractile substances applied to the outside of the lid—collodion, for example. If this is not sufficient to meet the case, some one of the many operations that have been proposed for the cure of the deformity will have to be undertaken. These operations consist, either in removing a narrow strip of skin and muscle parallel to the ciliary margin, so as to produce eversion by contraction of the cicatrix, or else in taking away the entire row of eyelashes.

ECTROPION

means the eversion of the lid—the opposite condition to the foregoing. The palpebral conjunctiva becomes visible, red and thickened, and the eyeball is exposed. It may be caused by abscess at the margin of the orbit, or by the contraction of a cicatrix on the face, or by inflammation and thickening of the conjunctiva, or by the dropping of the lower lid as a consequence of paralysis.

Treatment.—Little or nothing can be done short of an operation, and the precise nature of such an operation will depend upon the peculiar features of the case. Sometimes the redundant and thickened conjunctiva may be removed with scissors; sometimes a V-shaped portion of the lid may be excised; sometimes a flap of skin may have to be transposed, and a plastic operation performed.

PTOSIS

denotes a drooping of the upper lid, which produces both deformity and inconvenience. It depends upon paralysis of some portion of the third nerve. Such paralysis may be congenital, or it may be brought about by mere debility, or it may be caused by disease of the brain, either functional or organic. It is, therefore, not so much a disease in itself as an indication of disease elsewhere. Sometimes it arises without any assignable cause, and persists in defiance of every remedy. In such cases the patient generally acquires a certain degree of power over the lid by the action of the orbicularis palpebrarum muscle. It sometimes follows exposure to cold winds, especially in rheumatic subjects.

Treatment.—If the ptosis depends upon debility, we must endeavour to give tone and vigour to the system by a course of strengthening medicines, and by a regulated manner of life. If no cause can be assigned, and the disease does not yield to milder treatment, a strip of the skin at the upper margin of the orbit may be removed, so as to raise the lid by the contraction of the cicatrix. If the ptosis depends upon disease of the brain, it will often be found to be of syphilitic origin. If it follows exposure, the alkalies and colchicum (F. 51) may be given with advantage. Galvanism is sometimes beneficial for these cases, but must be used with caution.

EPIPHORA—STILLICIDIUM LACHRYMARUM.

Epiphora signifies an overflow of tears, the result of hypersecretion. When the overflow arises from obstruction to the onward passage of the tears, it is called *stillicidium lachrymarum.* The term epiphora is sometimes applied indifferently to both of these conditions.

Epiphora may depend upon an irritable state of the lachrymal gland, or of the entire surface of the eye. It is a frequent accompaniment of the scrofulous diseases of that organ.

Treatment.—The eye should be treated with sedative or astringent collyria. (F. 13, 22.) At the same time, the general health should be amended by alteratives and tonics, and by a regulated diet. In all cases the eye should be carefully examined, to see if any particle of sand, eyelash, or other foreign body is present.

Stillicidium lachrymarum may arise from a variety of causes—closure or displacement of the puncta, contraction of the canaliculi, inflammation of the sac, or thickening of the duct.

The *treatment* consists in allaying the acute inflammation, if that is the cause of the impediment, and making a free passage for the tears. If the disease depends upon some other cause, the canaliculi should be slit up to the inner canthus on a grooved director, introduced at the punctum, in the way recommended by Mr. Bowman. If the duct is obstructed, a nasal probe should be passed into the nose from time to time.

OBSTRUCTION OF THE NASAL DUCT

seems to arise from inflammatory thickening of the mucous membrane lining it. It is often associated with the scrofulous habit. The only *treatment* is to lay open the canaliculi, as explained above, and then to pass suitable probes along the duct until the natural passage is restored.

INFLAMMATION OF THE LACHRYMAL SAC

may be either acute or chronic. The chronic variety (mucocele) is often an extension of the disease from the nasal duct. It is marked by tenderness and swelling. A muco-purulent secretion can be squeezed upwards through the puncta. When the inflammation is acute there is pain, redness, and rapid distension, so that the sac threatens to burst.

Treatment.—The chronic inflammation should be treated by slitting up the canaliculi, and passing a probe into the noss, to ascertain that the passage is clear. The patient should frequently empty the sac by squeezing the contents downwards into the nose. At the same time, the general health should be carefully regulated.

The acute inflammation requires active antiphlogistic measures—purgatives, leeches, fomentations, &c. When suppuration has taken place, the sac should be opened freely by a horizontal incision through the skin at the most prominent part, and poultices applied.

FISTULA LACHRYMALIS.

When the sac suppurates and bursts, or when it is punctured through the skin, one of two things may happen—either the inflammation may subside, the tears may take their natural course, and the external opening may heal, or the duct may be left permanently obstructed, and the tears may make their way through the external opening, and flow over the cheek. The latter condition is called *fistula lachrymalis.*

Treatment.—Our aim is to open up a free passage for the tears *through* the lachrymal sac and nasal duct; and then the wound in the skin will close of itself. With this view, the lower punctum and canaliculus may be slit up, and probes passed from day to day until the passage is re-established.

SIMPLE CONJUNCTIVITIS

may be either *acute* or *chronic.*

In the *acute* form there is heat, pain, irritation, intolerance of light, with a sensation as if there were sand under the lids. On opening the eye, the conjunctiva is seen to be of a bright scarlet hue. The vessels are tortuous and injected, making their way from the margins of the globe towards the cornea. That they are no deeper than the conjunctiva is evident, for they shift their position as the membrane is moved. The secretion of tears is excessive, especially on opening the eyes. The digestive organs are generally disordered, and there is headache and feverishness.

The disease may be caused by the irritation of a foreign body, by over-use, by exposure to the glare of the sun, &c. Most frequently, however, it arises from cold and wet—the patient "catches a cold in his eye."

Treatment.—The cause should, if possible, be removed. The patient should be purged, should wear a shade over both eyes, and should stay indoors for a few days. The eye should be well fomented with plain water, or with a decoction of poppy-heads (F. 2), and the edges of the lids should be smeared with fresh unsalted lard. If there is much pain, and particularly if the patient is plethoric, leeches should be applied to the temples.

When the acute symptoms are beginning to subside, the eye should be frequently bathed with cold water, or with astringent lotions (F. 12, 13). At the same time, a solution of nitrate of silver, or of sulphate of zinc (gr. j—ij ad ℥j), should be dropped into the eye twice a day. After the bowels have been freely opened, the patient should have a light but nutritious diet.

The *chronic* form may arise from a continued irritation, as of inverted lashes; or, it may be a sequel to the acute disease. In the latter case it is generally associated with disordered and enfeebled health.

Treatment.—If the inflammation is the result of a previous acute attack, it will require to be treated by stimulant, astringent, or sedative collyria, as a solution of nitrate of silver, or the vinum opii. Occasionally a leech or a blister may be applied to the temple. But the most important point is to improve the general health by alteratives, tonics, exercise in the open air, and a regulated diet.

CATARRHAL OPHTHALMIA

is a variety of the simple inflammation, characterized by more or less swelling of the conjunctiva (*chemosis*), and by small extravasations of blood scattered over the surface. There is much lachrymation, and a thin muco-purulent discharge, which often becomes thick and creamy, and is no doubt contagious.

The *treatment* must depend in a great measure upon the individual case. Sometimes warmth and poppy fomentations give most relief. In other cases, cold water, or astringent applications, as the nitrate of silver (gr. j—ij ad ℥j), or alum (gr. ij—vj ad ℥j), dropped into the eye, are found most beneficial.

The bowels should be kept open, but the patient must not be lowered. The usual diet should be given, and in some cases wine and bark may be added with advantage. The eye should be kept very clean. The discharge and incrustation should be removed with tepid water, and a little simple ointment or cold cream be applied to the edges of the lids.

PURULENT CONJUNCTIVITIS

is an aggravated form of the preceding. The principal difference is in the severity of the symptoms and in the character of the discharge.

Symptoms.—There is great irritation, and pain shooting through the head, the eyelids are swollen and œdematous, so that the eye is closed, the conjunctiva is tumid from infiltration of serum and lymph, the vessels are gorged with blood, giving the membrane a bright red tint, and a rough irregular surface. This roughness is most marked on the palpebral portion. When it persists, it constitutes the condition known as *granular conjunctiva.* The cornea is more apt to be affected in this variety than in the simple catarrhal inflammation. There is profuse secretion of purulent matter. The constitutional symptoms are severe in proportion.

The disease may be caused by injury, over-crowding, deficient ventilation, want of cleanliness, exposure to intense glare, or to cold and wet. It is highly contagious. In Egypt it occurs as an epidemic, from the combined effects of sun, wind, and sand. It is said to be propagated there by the flies.

It may lead to sloughing of the cornea, disorganization of the eyeball, or granular conjunctiva.

Treatment.—A brisk purgative should be given, and a few *leeches* applied, if there is much heat and pain. As there is generally considerable depression, a good diet, with wine, ammonia, and bark, may be required from the first. (F. 30, 31.) But for this no precise rule can be laid down. The surgeon must be guided by the symptoms in each particular case. The patient should be confined to the house for a time, and have his room darkened, but well supplied with fresh air. The eyes should be constantly fomented, and every hour or half-hour they should be syringed out—first with warm water, so as to get rid of the secretion, and then with an astringent lotion, which may be composed of alum, sulphate of zinc, tannin, or nitrate of silver. This application may be combined with sedatives, or opium may be given by the mouth. It is a good plan for the surgeon himself to inject a solution of nitrate of silver (gr. ij—iv ad ℥j) once every day, for it frequently happens that through timidity, or unskilfulness, the syringing is not so effectually done as to wash every part of the conjunctiva. At night the edges of the lids should be touched with simple ointment or cold cream.

The greatest care should be exercised to keep separate all sponges, towels, handkerchiefs, &c., used by the patient, so as to prevent contagion.

When the acute symptoms have subsided, a solution of nitrate of silver (gr. j—ij ad ℥j) may be dropped into the eye twice a day, and a blister occasionally applied to the temple. Strengthening medicines should be continued for some time after the disease has been arrested.

OPHTHALMIA NEONATORUM

is the name given to purulent conjunctivitis, when it occurs in children a few days after birth. In such cases it most probably arises from the infection of a vaginal discharge in the mother. It may, however, result from a want of proper cleanliness, from excessive exposure to light, or other causes.

The symptoms are those of acute purulent conjunctivitis.

The special *treatment* consists in syringing the eye, every hour or half-hour, with an alum lotion (gr. v ad ℥j), so as to wash away the secretion as fast as it forms. Simple ointment should be smeared along the lids. The constitutional treatment should on no account be neglected. Two or three drops of liq. cinchonæ and sal volatile in ℥j of water may be given with benefit every three hours.

If taken in time, and perseveringly treated, the inflammation generally subsides, without leaving any ill effects behind it.

As any one lotion seems after a time to lose its effect, it is well to vary the applications occasionally, or to combine them. (F. 23.) In these cases, too, the surgeon may now and then apply the stronger solution of nitrate of silver with advantage.

The extreme ectropion, which sometimes occurs in cases of this kind, generally disappears as the eye become stronger. It may, however, be alleviated by an elastic band placed round the head, and passing over small soft pads fitted upon the lids.

GONORRHŒAL OPHTHALMIA

is the most aggravated form of purulent conjunctivitis. It is excited by the application of gonorrhœal matter to the eye.

The symptoms are essentially the same as those of the acute purulent conjunctivitis. They are, however, very intense, and run a rapid course. Unless the disease is arrested, it leads in a very short time to sloughing of the cornea, and protrusion of the contents of the eyeball.

The *treatment* should be prompt and active. It must be conducted on the principles already laid down in speaking of acute purulent conjunctivitis. Especial care should be taken lest the discharge from the affected eye be conveyed to the other. The sound eye should therefore be kept closed by a clean pad of cotton-wool. Of course equal precautions must be taken that no one else becomes inoculated with the purulent matter. The eye should be bathed and wiped with clean pieces of linen rag, each piece being burnt immediately after use.

However successful the treatment may be, it is almost sure to be followed by more or less granulation of the conjunctiva. This should be promptly attended to, lest it should become chronic, when it would be much more difficult to cure. Bluestone may be applied in the solid form; or finely-powdered acetate of lead may be spread upon the everted lid, and rubbed into the folds and crevices of the conjunctiva, care being taken to wash away the superfluous substance, by means of a stream of tepid water from an elastic bottle, before the lid is returned to its proper position. The application may be repeated once a week. In the intervals, a solution of sulphate of copper, or of zinc, or of nitrate of silver (gr. ij ad ℥j), may be dropped into the eye with a quill, or camel's-hair brush, two or three times a day.

As the nervous irritability and the mental depression are usually very great, stimulants—*e.g.*, ammonia, brandy, champagne—and a liberal diet should always be ordered.

STRUMOUS OPHTHALMIA

is a disease which is very common among scrofulous children.

Symptoms.—The conjunctiva is slightly and irregularly vascular, and in the centre of each patch of enlarged vessels is a small pimple or pustule (*phlyctenula*). This is generally seated on, or near, the margin of the cornea. There is usually great intolerance of light. The child buries its head to avoid exposure. The eyelids are forcibly contracted, and the lashes inverted. In other cases, however, there is little or no photophobia, and but slight pain. Tears are constantly trickling over the cheeks. With this there are the general marks of scrofula.

Treatment.—The local irritation may be allayed by fomentations, by anodyne drops, especially of the sulphate of atropine (gr. j ad ℥j), or by rubbing belladonna ointment round the eye, while conium, henbane, or opium is given internally. If the disease is of long-standing, counter-irritation to the temples, by iodine tincture, or blisters, or a seton, may be very useful. In the chronic stage a solution of nitrate of silver (gr. j—ij ad ℥j) should be dropped into the eyes at night.

Care should be taken to smear the lids with simple ointment, so as to prevent them from sticking together during sleep. When there is no photophobia, calomel, dusted into the eye with a brush, often does good. If the first application causes much pain and irritation, it must not be continued; otherwise it may be repeated daily, and even for a few days after the phlyctenula has disappeared. The same treatment is useful for the ulcers which are sometimes left when the pustule has been situated on the cornea. But the most important part of the treatment is the constitutional. Fresh air, and, if possible, a residence at the sea-side, moderate exercise, a regulated diet, alteratives, cod-liver oil, the preparations of quinine and iron—especially the syrup of the iodide and phosphate (F. 39, 42, 55, 56)—these are the remedies which are most likely to do good.

GRANULAR CONJUNCTIVA

has been already alluded to as a condition which is apt to remain after an attack of purulent ophthalmia. It depends upon a thickened and hypertrophied state of the mucous membrane of the palpebral conjunctiva. The papillæ become prominent and irregular, so as to give the appearance of a granulating surface.

It is easy to understand that this rough surface rubbing up and down aggravates any inflammation that may exist, and keeps up a chronic state of irritation, so that in course of time it renders the cornea opaque, like ground glass.

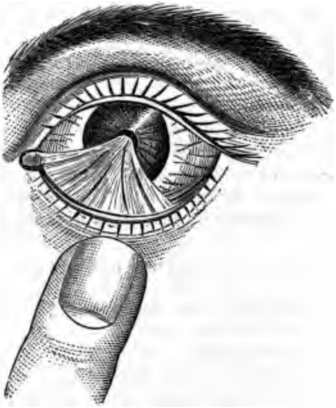
Treatment.—Our aim is to destroy the granulations. With this view they may be touched with nitrate of silver or sulphate of copper, in the solid form or in solution. Some recommend the liquor potassæ; others the acetate of lead; others, again, prefer counter-irritation on the outside of the lids. In any case the state of the general health ought on no account to be neglected.

When the whole cornea has become hazy, and has large vessels ramifying throughout it, it is the modern practice to inoculate the eye with purulent matter, so as to set up an acute inflammation. This leads to the destruction of the granulations, as well as to the absorption of the effused lymph, upon which the "ground glass" appearance of the cornea depends. By this means a valuable degree of sight is often restored to the patient. But inoculation must never be employed, unless the cornea is vascular and hazy *in every part.*

PTERYGIUM

is the name given to a thickening or fleshy growth of the ocular conjunctiva. It generally takes something of a triangular shape, with its apex towards the cornea. In the case from which Fig. 86 was taken both eyes were symmetrically affected. Of its causes and pathology nothing is known. A large proportion of those who are affected by it have lived for a longer or shorter time in the tropics. At first, it is only unsightly, but by degrees, as it encroaches on the cornea, it interferes with vision.

Fig. 86.



Pterygium.

The most effective *treatment* is transplantation. The growth is dissected off as far as the base, then turned back, and received into a slit in the conjunctiva, where it is kept in place by two or three stitches. In this position it gradually wastes, and disappears; but when entirely excised it has a great tendency to return.

INFLAMMATION OF THE CORNEA

(*Keratitis, Corneitis*).—The inflammation may begin either in the cornea itself, or it may spread to it from an adjacent tissue.

It may be caused by an injury, or by debility, or by a specific poison in the blood. It is very common in scrofulous children, and in the subjects of hereditary syphilis. It may be either superficial or deep-seated; and it may lead to the effusion of lymph, or to suppuration, or to ulceration, or to sloughing.

Symptoms.—There is pain in the eye and head, a constant flow of tears, intolerance of light, haziness and vascularity of the cornea, with a dilated state of the vessels of the sclerotic, which form a fringe around the margins of the cornea. When the disease has advanced further, there may be ulceration, or suppuration, or pus in the anterior chamber.

Treatment.—A calomel purge, fomentations, anodyne lotions, sometimes a few leeches, counter-irritation by blisters, or iodine paint applied to the temples—these are the best remedies. Stimulating applications should be avoided. The patient should wear a projecting shade over both eyes, have good food, and plenty of fresh air. He should also take a course of strengthening medicine, with alteratives. If there is evidence of scrofula, cod-liver oil and steel should be given. If there is a syphilitic taint, mercurials or the iodide of potassium will be necessary.

ABSCESS OF THE CORNEA

is one of the results of keratitis. The matter forms between the layers, either in patches, or else it sinks down to the bottom, and appears in a crescentic shape (*onyx*).

Treatment.—Atropine or belladonna lotions (F. 1) to allay pain, fomentations, counter-irritation to the temples, good food, tonics, and stimulants—these are the means upon which we rely.

If the pus is not absorbed, the abscess will either burst through the posterior elastic lamina into the anterior chamber, forming *hypopyon;* or else it will make its way forwards, and produce an ulcer of the cornea. It is sometimes of advantage to puncture the cornea at the seat of the abscess; or, if there is great pain, to evacuate the aqueous humour by a broad needle passed through the corneal margin.

ULCER OF THE CORNEA

is often the consequence of keratitis; but it may arise from other causes, as debility, injury, or a superficial pustule.

Ulcers of the cornea follow the same general types as ulcers elsewhere. Sometimes they are *acute*, spreading rapidly, and with sharply-cut margins; sometimes they are *irritable*, attended by great pain, lachrymation, and photophobia; sometimes they are *healthy* and *healing*, the edges rounded off, and the surface covered with a greyish effusion of plastic lymph.

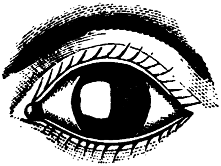
Treatment.—In the case of the healing ulcer, we have nothing to do but to "let well alone;" to give the eye perfect rest, and to support the general health. When the ulcer is irritable, fomentations and atropine or belladonna lotions should be used. If the rest is disturbed, sedatives may be given at night. Sometimes a rapid improvement is effected by keeping the eye closed with a soft compress and bandage. In other cases, when there is great pain, or a threatening of perforation, the puncture of the cornea with a broad needle, to allow the escape of the aqueous humour, is of much benefit. If the ulcer is in the acute stage, leeches, or counter-irritation, applied to the temples, and anodyne lotions, are the best remedies. Lead should never be used, as it is apt to leave a permanent stain on the surface of the ulcer.

The cicatrix which is left after an ulcer heals, is always rather opaque; except in the case of the most superficial ulcers, which may leave no trace behind them.

Atropine and belladonna lotions are almost always of value, not only by dilating the pupil, and keeping the iris from approaching the cornea, but also from their soothing and anodyne influence.

OPACITY OF THE CORNEA.

Fig. 87.



Leucoma.

The opacity which results from the healing of a cicatrix is called *leucoma*. But there is another kind of opacity, resulting from the deposit of lymph between the layers of the cornea, or between it and the conjunctiva. When such deposit is only slight, and has a cloudy, diffused character, it is termed a *nebula*; when it is denser, and presents a pearly appearance, it forms *albugo*. Fig. 87 was taken from a case of congenital leucoma, which occurred at the Royal Ophthalmic Hospital at the time I was Mr. Bowman's clinical assistant.

Little or nothing can be done to remove these opacities. In children, they often gradually disappear in the lapse of months or years. After the age of puberty, they rarely undergo much alteration, if they have existed for any length of time; but in the more recent cases, counter-irritation by blisters or setons, stimulating lotions, and tonics medicines, may be of use.

The opacity resulting from granular conjunctiva has been already mentioned, and its appropriate treatment explained.

STAPHYLOMA (*Anterior*)

is the term applied to a protrusion on the anterior surface of the eyeball. It may result from a wound, or from the partial, or complete, destruction of a portion of the cornea by ulceration. If there is only a small hole perforated in the cornea, then a part of the iris alone will protrude (*s. iridis*). But if a large portion of the cornea has either been destroyed or weakened, there will be an extensive protrusion. This becomes covered with a fibrinous deposit, and gradually increases in size, until it may contain the lens and a considerable portion of the vitreous body.

Treatment.—In the former case the lids should be kept closed with a pad and bandage. The protrusion may be punctured from time to time, or touched with lunar caustic, or even entirely snipped off. It will then shrink, and nothing remain but a scar. In the latter case, the best thing that can happen is that the staphyloma should collapse, so as to allow the patient to wear an artificial eye. Sometimes a free incision is made across the protrusion with this view. Sometimes the staphyloma is sliced off. Sometimes the operation of "abscission" is performed, according to Mr. Critchett's method. Lastly, the entire globe may be extirpated.

CONICAL CORNEA.

Sometimes the cornea, without losing its transparency, gradually assumes a conical shape. This gives the surface a peculiarly bright, suffused appearance. Generally, both eyes become affected in a greater or less degree. As the disease advances, it seriously impairs the sight. The apex of the cone becomes thinned and nebulous, and may at length give way.

The *treatment* is unsatisfactory. Sometimes concave glasses are useful. Sometimes the patient can see tolerably well by looking through a small hole, or slit, pierced in a plate of black wood or metal. Sometimes both these remedies can be combined.

Iridectomy seems to arrest the progress of the disease, as well as to improve vision, by allowing the rays of light to enter the eye through the less conical portion of the cornea. The late Professor von Graefe shaved off a thin slice from the apex of the cone, and, by touching the point at intervals with nitrate of silver, caused a cicatrix, and thereby lessened the conicity. Mr. Bowman removes with a trephine and a sharp knife a small layer from the apex, and by repeated punctures of the thinned structure, brings about a gradual contraction and diminution of the cone. This operation sets up much less irritation than Von Graefe's, and is equally effective.

ARCUS SENILIS

is the term applied to the yellow or whitish ring which is often seen round the margins of the cornea in elderly persons. It consists, as Mr. Canton has shown, of a deposit of fat. He has fully discussed its nature, varieties, and pathological significance in his treatise on the subject. Its practical importance has been summed up by Sir James Paget, as follows: "The arcus senilis seems to be, on the whole, the best indication which has yet been found of proneness to an extensive or general fatty degeneration of the tissues" (Lecture VI.)

It admits of no remedy, and does not interfere with any operation which it may be necessary to perform upon the eye.

SCLEROTITIS.

The sclerotic often participates in inflammation of the cornea or of the iris, but it may also be primarily and chiefly affected. Such cases are sometimes spoken of as *rheumatic ophthalmia*, because the sclerotic is a fibrous tissue, like those which are the chief seats of rheumatism, and because the inflammation of the sclerotic is often caused by cold and wet—the conditions which lead to rheumatism in other parts of the body.

Sclerotitis is a disease of adult life, and is often confined to one eye. Sight is impaired. There is intense pain of an aching kind, which is worse at night, and which pervades the orbit and brow, as well as the eyeball. The vessels of the sclerotic are seen radiating in straight lines round the margin of the cornea, and presenting a pink or violet hue. There is generally a good deal of fever, and there are often rheumatic pains, or symptoms of gout, in other parts. The iris often participates in the inflammation.

Treatment.—The bowels should be cleared, and then quinine or the iodide of potassium or colchicum should be given (F. 51), with opiates or sedatives at bedtime. (F. 5, 37.)

Locally, anodyne ointments or lotions, and the application of dry heat, are the most useful measures. Blisters and leeches often increase the neuralgic pain. Atropine should be dropped into the eye twice a day, both to dilate the pupil and to act as a sedative. (F. 4.)

IRITIS

may be excited by an injury, or by an excessive use of the eye, or it may arise spontaneously. In the latter case it is generally associated with a rheumatic or syphilitic state of the constitution.

The injuries which are most likely to lead to iritis are blows upon the eye, and wounds of the iris, especially when a foreign body is lodged in contact with it. A clean-cut wound, such as that which is made in iridectomy, seldom sets up much inflammation.

Iritis may be either *acute* or *chronic*. When it is dependent upon a rheumatic or syphilitic taint, it is particularly apt to become chronic. Under any circumstances, when it has once appeared, it is prone to recur.

General Symptoms.—There is a pink or violet zone of vessels around the margins of the cornea, as in sclerotitis. The aqueous humour becomes muddy or yellowish. The iris is clouded and covered with a film, so that its structure cannot be distinctly seen. Its colour is altered, and it appears of a dusky brown, or of a greyish green, owing in some measure to discoloration of the aqueous humour. Its movements are limited by the effusion on its surface and into its substance; and the pupil becomes small and irregular. There is impairment of vision, with lachrymation and photophobia. There is great pain in the eyeball, orbit, and brow. With this there may be more or less inflammation of the cornea and conjunctiva. There is always a good deal of constitutional disturbance.

Special symptoms of rheumatic iritis.—The attack has probably been brought on by exposure to cold and wet. There may be a history of rheumatism or gout. The sclerotic is largely implicated in the inflammation, and its vessels are congested, so that the vascular zone is not sharply defined. The neuralgic pain in the eye and brow is very severe, and there is great intolerance of light.

Special symptoms of syphilitic iritis.—There is a history of syphilis, and often there are some other manifestations of the disease present at the same time. The effused lymph is not spread over the entire surface of the iris, but aggregated here and there in the form of minute nodules or beads. The vascular zone is well defined. There is generally less intolerance of light than in the rheumatic variety. The pain remits during the day, and is worse at night.

Treatment.—The patient should be confined to a darkened room, or wear a shade. If it seems advisable, the temples may be cupped, or leeched. Under any circumstances the bowels should be freely opened, and a moderately low diet enforced. The pupil should be thoroughly dilated with a solution of atropine (gr. j—ij ad ℥j). The effusion of lymph may perhaps be prevented, or its absorption promoted, by small doses of mercury, stopping short of salivation—two grains of calomel with a quarter of a grain of opium, or three grains of grey powder, every four hours, for example. Pain should be relieved by belladonna fomentations; by giving opium, conium, or henbane; and by rubbing anodyne ointments into the brow.

Special treatment of rheumatic iritis.—The bicarbonate of potass (F. 46), or the iodide of potassium, or guaiacum, or quinine (F. 55) should be administered. If there is a gouty habit, colchicum will be found useful. The patient should not be kept on too low a diet. In some cases he will even require brandy or other stimulants from the first.

Special treatment of syphilitic iritis.—If the patient's constitution is sound, a course of mercury by the mouth, or by inunction, may be prescribed, so as slightly to affect the gums. Under any circumstances the iodide of potassium may be given (F. 50). As soon as the acute symptoms begin to yield, tonics should be ordered, and a more liberal diet allowed.

If iritis in any of its forms threatens to become *chronic*, the temples may be leeched from time to time, and counter-irritation kept up by means of iodine paint, blisters, or setons.

In recurrent iritis, iridectomy will arrest, or at least lessen, the severity of the attacks. It appears to act partly by putting an end to the irritation caused by the adhesions (*synechiæ*), which are almost sure to follow repeated attacks of inflammation, and partly by allowing a freer communication between the anterior and posterior aqueous chambers.

ARTIFICIAL PUPIL.

When the natural pupil is obscured by central opacity of the cornea, or has become closed by inflammatory deposits or adhesions, while the rest of the cornea retains its transparency, an artificial pupil may sometimes be formed, so as to allow the rays of light to reach the retina.

The operation may be performed in several ways. Generally, however, it is done by excising a portion of the iris (*iridectomy*), or by putting a ligature round it (*iriddesis*). A small incision is made at the margin of the cornea in such a situation as to allow the iris to prolapse, or to be drawn gently out. This portion of the iris is then either cut off, or included in the ligature of fine silk, according to the judgment of the surgeon.

In cases of closed pupil after the extraction of cataract, a broad needle may be introduced through the cornea, and the fibres of the iris torn through, or divided, until a sufficient aperture has been made.

CATARACT

signifies an opacity of the lens or its capsule. When the lens alone is affected, it is said to be *lenticular;* when the capsule alone is affected, it is said to be *capsular*. Generally, however, both are more or less implicated in the disease.

It may be a congenital defect, or it may be traumatic, and result from the inflammation which has been excited by an injury, or even from the shock of a blow which leaves no external mark. Most frequently, however, it comes on gradually with old age, and is one of the many manifestations of the degeneration which the body is apt to undergo as life advances. The proper tissue of the lens seems to become opaque and atrophied, while there is a deposit of fatty and earthy matter in the more superficial parts.

Symptoms.—Vision is impaired, the sight becoming progressively worse as the disease advances. The patient can generally see best in twilight, or when his back is turned to the window, because then the iris expands, and allows the marginal rays to reach the retina. The eye presents a dull appearance, and, on examining it closely, the lens is seen to be of a pearly white or of a yellowish colour.

Cataracts are broadly divided into *hard* and *soft*.

The *hard* cataract is met with in middle-aged and elderly persons. It has a yellowish or brownish tint. The opacity may be greatest at the centre, and then the patient can see best when the pupil is dilated by atropine or otherwise; but sometimes the circumference of the lens is chiefly affected.

The *soft* cataract is a disease of the young or middle-aged, and is not unfrequently congenital. It has a white, milky colour. The lens is enlarged, and vision is much, and uniformly, impaired. In the congenital form, however, the opacity may be confined to the central parts of the lens, and remain for many years without extending to the margins.

The *treatment* consists in removing the lens by operation. Medicine has no power to arrest the progress of the disease, or to procure its absorption.

The lens may be removed in several ways—(1) by extraction, (2) by depressing it below the axis of vision (couching), (3) by breaking it up, and leaving it to be absorbed (solution), (4) by removing the lenticular matter through a small aperture in the cornea (linear extraction).

1. Extraction is performed by making an incision through half of the circumference of the cornea, opening the capsule, and allowing the lens to escape entire through the pupil.

A method of extraction, known as Von Graefe's opération, is much practised at the present time. The incision is made with a long narrow knife just within the corneal margin, occupying about one third of the circumference; a piece of iris is removed, the capsule torn, and the lens pressed out, as in ordinary extraction. By this operation all risk of prolapse of the iris, which is so common after the usual operation, is done away. The recovery of the eye, too, seems to be more rapid. If the iridectomy is made upwards, the irregularity of the pupil is hidden by the upper lid, and the sharpness of vision does not appear to be diminished.

If all goes on well, the wound is healed by the end of a week or ten days, but the eye will require protection and rest for a considerable time. The patient should not be allowed to use the glass, which will be necessary for accurate vision, for at least three or four months.

2. The operation of couching consists, as we have said, in depressing the lens below the line of vision. By the aid of a couple of needles it is lodged in the vitreous humour, behind the ciliary processes, and gradually undergoes absorption.

Couching is an operation which is very seldom performed at the present day. It is rough in execution, and apt to excite serious inflammation, with perhaps the ultimate loss of vision.

3. Solution is a method of treatment particularly applicable to the softer varieties of cataract. One or two needles are introduced near the margin of the cornea, and the anterior capsule of the lens is torn through, so that the aqueous humour comes in contact with the lenticular substance. Absorption then takes place. The operation may have to be repeated two or three times before the whole of the cataract has been absorbed. On this account, the process is rather a tedious one.

4. Linear extraction is a modern improvement on the foregoing. After the capsule has been ruptured, either at once or after a few days' interval, the soft lenticular matter is stirred up, a curette is introduced through a suitable wound in the cornea, and the whole, or the greater part, of the lens is removed.

Before solution is undertaken, the pupil should be dilated with atropine; and it should be kept dilated until entire absorption has taken place. It is often beneficial to support the eye by a light pad of cotton-wool and a bandage. Where only a small corneal wound has been made, a thin piece of wet linen, laid over the eye, is all that will be required.

In every case in which the lens has been taken away the patient will have to use a convex glass to correct the refraction.

GLAUCOMA

is a disease which has attracted a great deal of attention of late years. Though it has been very carefully studied, its pathology is not yet satisfactorily explained. It seems to depend upon intra-ocular pressure, which first palsies the retina, and then gradually disorganizes the other structures of the eye.

The disease is now usually divided into the *inflammatory* and the *non-inflammatory* varieties. The inflammatory cases are further subdivided into *acute* and *chronic.*

Acute glaucoma is generally preceded by a premonitory stage, during which the patient is liable to occasional attacks, attended with increased hardness (tension) of the eyeball, congestion of the vessels, dimness of sight, and pain in and around the eye. There is increasing presbyopia, and contraction of the visual field. When the patient looks at a lighted candle, he sees a halo or rainbow around the flame. These attacks become more frequent, till at last the patient is suddenly seized with great pain in the eye and neighbouring parts, with feverishness and sickness. The eye is found to be very hard, the lids swollen, the conjunctiva inflamed, the pupil dilated, the anterior chamber shallow, and the cornea hazy. Vision is impaired or destroyed, and there are flashes or stars of light before the eyes. Generally the humours are so cloudy that an ophthalmoscopic examination cannot be made.

The attack may yield to treatment, or it may subside spontaneously, and the patient may recover a portion or the whole of his sight. But after a time it recurs, and the vision is either irreparably lost, or the inflammation passes into the chronic form.

Chronic glaucoma may follow an acute attack, or it may be gradually developed from the premonitory stage. The eye remains hard, the field of vision is contracted, there is dimness of sight, there are motes before the eyes by day and flashes or sparks by night, the pupil is dilated and sluggish, there are frequent attacks of pain, the conjunctiva is congested, and there are large tortuous veins on the sclerotic, the cornea becomes rough, hazy, and callous, and the humours become turbid. If an ophthalmoscopic examination can be made, the retinal veins are seen to be dilated and tortuous, while the arteries are small and pulsating, and the optic nerve is cupped, or hollowed out, from the continued intra-ocular pressure. Spots of hæmorrhage are also often visible about the fundus.

Non-inflammatory or simple glaucoma comes on so gradually, that it often passes unnoticed, until the patient suddenly finds that he has lost the sight of one eye. The eye may look quite healthy, the media may be clear, and the movements of the iris may be normal. There is generally, however, increased hardness of the eyeball, and, on an ophthalmoscopic examination, the optic nerve is found to be cupped, with dilated retinal veins and pulsating arteries. The sight gradually fails, and the field of vision becomes contracted.

The disease may thus advance painlessly to blindness; but it more frequently takes, after a time, the characters of the acute or chronic inflammation, and presents the symptoms which have been already described in speaking of those varieties.

Glaucoma may also follow various affections or injuries of the eye, as choroiditis or traumatic cataract.

It is then termed *secondary*. For details of these varieties, the reader may be referred to Mr. Soelberg Wells's excellent treatise on the subject, or to Mr. Lawson's work on the Diseases and Injuries of the Eye.

Treatment.—Medical treatment is of little avail in any of the various forms of glaucoma. The immediate inflammation and pain may be relieved by mercury, opium, leeches, fomentations, &c., but the eye is not *cured*. Sooner or later the disease will again show itself, perhaps more acutely than before.

Several operative measures have been adopted for the relief of this affection.

Paracentesis of the anterior chamber is of value in relieving the immediate symptoms, and, if it is frequently repeated, it may arrest the disease for a time.

Mr. Hancock recommends *the division of the ciliary muscle.*

In 1856, the late Prof. von Graefe, of Berlin, introduced the method of treating glaucomatous affections by the removal of a portion of the iris (*iridectomy*). This measure has been extensively practised in this country, and appears to be followed by excellent results.

AMAUROSIS.

The term *amaurosis* used to be employed to denote dimness, or loss of sight, from causes unexplained by the external appearance of the eye, and which was attributed to disease of the retina, optic nerve, or brain. But, since the introduction of the ophthalmoscope, our knowledge of the diseases affecting the deeper structures of the eye has made great progress. Many of the cases which were formerly called amaurosis have been classified under other heads, and the term is now, by common consent, confined to blindness depending upon cerebral or cerebro-spinal causes. Thus it includes most of the examples of atrophy of the optic nerve.

The most frequent cerebral causes of amaurosis are tumours, syphilitic deposits, blood clots, hydrocephalus, meningitis, and embolism; while the most frequent spinal cause is locomotor ataxia.

The prognosis in all these cases is unfavourable—indeed, it is only when the disease is of syphilitic origin, or when it depends upon general anæmia, or uterine derangement, that medicine can do anything to effect a cure.

FOREIGN BODIES ON THE CONJUNCTIVA OR CORNEA.

Foreign bodies, such as eyelashes, particles of dust, &c., often adhere to the conjunctival surface, and give rise to great uneasiness. If they are not removed, they may even produce a considerable amount of inflammation. They are generally situated just above the margin of the upper lid. To remove them from this position the lid must be everted. This is done by laying a probe across the upper lid about half an inch from its margin. The central eyelashes are then taken between the finger and thumb of the other hand, and drawn outwards, whilst the probe is gently pressed upon the lid, and the patient is told to look downwards. By this means the tarsal cartilage will tilt over, and expose the conjunctival surface. The foreign body may then be removed with a camel's-hair brush, a feather, or a "spud." If the particle is imbedded in the conjunctiva, it may be lifted out with a broad needle. Or the conjunctiva may be raised with a small pair of forceps, and the piece, in which the foreign body is embedded, snipped off with scissors. The trifling cicatrix thus made soon heals, and leaves no trace behind it.

Particles imbedded in the cornea are held so tight by the elastic structure, that they are often difficult to remove. They consist generally of sharp fragments of metal, sand, or coal.

In order to extract them, the patient should be directed to fix his eye on some convenient point, and then, the globe being steadied, the particle may be picked out with a "spud," or with the point of a cataract knife.

If the particle is deeply imbedded, or if the patient is unable to control the movements of the eye, it may be necessary to give chloroform before extraction will be possible.

WOUNDS OF THE EYEBALL.

If the globe is simply wounded, the best thing that can be done is to close the lids, fix them with a strip of plaster, and give firm support to the eye by means of a pad of cotton-wool and a bandage. Should inflammation arise, it must be treated by the ordinary measures—leeches, fomentations, &c.

When the eyeball has been wounded, and a foreign body lodged in it, an attempt should be made to remove the extraneous substance at once. If this is not done, it may set up suppurative inflammation, and lead to the destruction of the eye. After the removal of the foreign body, the case must be treated as a simple wound.

TUMOURS OF THE EYEBALL

are generally malignant in their nature. In early life the eye is apt to be attacked by *medullary sarcoma,* or rather by that variety of it, the small round-celled sarcoma, known as *glioma.* The disease appears to spring from the retina or choroid. It grows rapidly, fills the globe, bursts the tunics, and then protrudes between the lids in a fungous mass.

In later life the choroid often becomes the seat of *melanotic cancer.* The disease advances very slowly. It may, however, be easily detected in its early stage by the ophthalmoscope.

In children scrofulous deposits in the deep structures of the eye are not uncommon, and produce equally destructive results, as far as the eye is concerned.

Treatment.—In any case the only remedy is the extirpation of the eyeball. This is done by slitting up the ocular conjunctiva around the globe, and dividing each of the tendons in turn. The eye is then drawn gently forwards, and the optic nerve cut with a pair of curved scissors. The bleeding should be arrested by a stream of cold water; a fold of wet lint should be laid over the orbit, and perfect rest enjoined for some days.

SQUINTING,

or *strabismus,* may be defined to be a want of parallelism between the visual axes of the eyes. If the lines of sight converge, the squint is said to be *convergent;* if they diverge, it is said to be *divergent.*

When only one eye is affected, the squint is said to be *single.* When the obliquity is observable in both eyes, it is termed *double.*

Squinting depends upon a want of equilibrium between the opposing muscles of the eyeball. This want of equilibrium may be congenital, or it may come on at any period of life. The causes which give rise to it are numerous. Sometimes it follows the irritation of teething, or of worms. Sometimes it is a sequela of fever, or of exanthematous disease. Sometimes it arises from weakness of one eye, and consequent want of use. Sometimes it depends upon defective vision, such as myopia, or hypermetropia. Sometimes a nebula on the cornea leads the patient to use his eye obliquely. Sometimes it is associated with hydrocephalus, convulsions, or compression of the brain.

The *treatment* necessarily varies with the cause. When the squint depends upon organic disease of the brain, nothing can be done to remedy it. When it is a symptom of compression, we must endeavour to remove the compressing force. When it is due to irritation, it may be relieved by judicious medical treatment. But when it is congenital, or has existed for a long time, when the eyesight is unimpaired, and when there is no disease of the brain or retina, an operation should be recommended. The tendon of the preponderating muscle should be divided, close to its insertion into the globe. If the squint is convergent, the internal rectus will have to be cut; if the obliquity is outwards, the external rectus must be divided.

The patient being anæsthetized, the conjunctiva at the lower margin of the tendon, near its insertion, is raised with a forceps, and snipped with a pair of scissors; a blunt hook is then passed under the tendon, which is next divided subconjunctivally with the scissors. Sometimes a second opening is made in the conjunctiva at the upper border of the tendon to allow the effused blood to escape.

ACCUMULATION OF WAX IN THE EAR.

Not unfrequently the wax, mixed with hairs and epithelium, collects in hard, dark-brown masses in the external meatus. When this happens, it gives rise to deafness and crackling noises in the ears.

The *treatment* consists in dropping a little oil, or glycerine, into the ears every night, and syringing them gently, but efficiently, every morning with warm water, until all the superfluous wax has been removed.

OTORRHŒA

is the name given to a purulent, or muco-purulent, discharge from the ear. It may arise either from inflammation of the external meatus, from polypus, or from disease of the internal ear. The first variety is often seen in scrofulous children; the last is a frequent consequence of scarlatina.

Treatment.—In the first case the meatus should be syringed with warm water, or with astringent lotions, while attention is paid to the general health. If the disease is situated in the inner ear, and the tympanum is perforated, the case is much more serious. There is danger of meningitis, or abscess of the brain, or phlebitis, or other complications. During the acute stage, the treatment must be active—leeches behind the ear, fomentations, purgatives, and salines. Afterwards a course of tonics will be very beneficial, and the impairment of hearing, which is sure to follow, may be remedied by an artificial tympanum.

POLYPUS OF THE EAR.

The polypi which are met with in the ear generally spring from the bottom of the meatus. They are of a bright red colour, and are composed of fibro-plastic tissue. Sometimes they are attached by a broad base, sometimes by a narrow pedicle. They are accompanied by a muco-purulent discharge.

The *treatment* consists in removing them by a polypus-forceps, or scissors, and touching the spot from which they grew with a fine pencil of lunar caustic.

FOREIGN BODIES IN THE EAR.

Foreign bodies, such as peas, beads, pebbles, &c., are sometimes lodged in the ear, and cause great anxiety and alarm.

In such a case the first thing to be done is to examine the ear, and make sure that there really *is* a foreign body present, as well as to ascertain its size and situation. This may be done by throwing light into the ear through an ear speculum, or a cone of white paper.

A fine forceps, or a small scoop, may then be introduced very gently, and the object withdrawn. Or it may be washed out by injecting a stream of tepid water. If these means fail, it is better to leave it to make its own way out. Force should on no account be used; it is most dangerous.

EPISTAXIS,

or bleeding from the nose, may be the result of an operation or an injury; or it may depend upon plethora and active congestion, or upon passive congestion with disease of the heart or lungs, or upon a medullary growth within the nose, or upon an impoverished state of the blood, arising from scurvy or fever; or it may arise from various other causes.

If the hæmorrhage occurs in a plethoric person of middle age, who is subject to giddiness, or other cerebral symptoms, or if it seems to be associated with inflammation of some adjacent part, we must not be in too great a hurry to arrest it.

But if the bleeding arises from an operation or an injury, or if it depends upon disease of the heart or lungs or general system, then we must take means for stopping it. The patient's head should be elevated, his nose well bathed with cold water, or a bag of ice laid on his forehead; he should snuff up powdered matico or gall-nuts; styptics—solution of alum or of the perchloride of iron—should be injected into the nostril; the anterior nares should be plugged with strips of lint, dipped, if need be, in a styptic solution. If all these measures fail, the posterior orifice must be closed as well.

Plugging the posterior nares.—This is done by arming a catheter, or an elastic bougie, or the instrument made for the purpose, with a fine twine, and then passing it along the floor of the nose, and making the point project below the soft palate. A forceps is then introduced into the pharynx, the twine is seized, and one end of it is brought out at the mouth. The instrument is then withdrawn from the nose, leaving the twine as before. We have thus got a ligature passing along the floor of the nose, through the posterior nares, looped round the soft palate, and emerging at the mouth. A small roll of lint, or a piece of sponge of suitable size, is next attached to the lower ligature, twelve or fifteen inches from the end of it. By gently pulling the upper or nasal ligature, the plug of lint or sponge is drawn into the mouth, behind the soft palate, and into the posterior nares. Both the ligatures should then be secured, and the plug allowed to remain for two or three days—in fact, until it becomes loose.

Sometimes it is necessary to plug the anterior as well as the posterior nares, in which case the string that projects from the nostril may be used to secure the anterior plug.

LIPOMA

is the name given to tumours which are sometimes seen on the external surface of the nose. The tip becomes bulbous, and gradually enlarges, until one or more round, pendulous masses are formed. They consist of an hypertrophy of the skin, subcutaneous areolar tissue, and fat. The skin appears coarse, the sebaceous glands become distinct, the vessels are prominent, and the tumour has a purple or livid colour. Altogether it is very unsightly, and gives rise to great inconvenience.

Treatment.—During the earlier stages it may be bathed with stimulating or astringent lotions: but when it attains such a size as to interfere with the uses of the nose or mouth, it should be removed with the knife.

POLYPUS OF THE NOSE.

The polypi which are met with in the nose are of two kinds—1, gelatinous; 2, fibrous.

1. The gelatinous polypi consist of an expansion of the elements of the mucous membrane and submucous tissue. They are generally multiple, pear-shaped, and grow rapidly. They always spring from the outer wall of the nasal cavity, and are most frequently connected with the superior turbinated bone.

2. The fibrous polypus springs from the periosteum, and is often connected with the sphenoid bone, or the basilar process of the occipital. It is usually single, attached by a broad base, and grows slowly. Its texture is fibrous, or fibro-cellular. It is very prone to degenerate, and to assume a malignant character.

Symptoms.—Discharge from the nose; the Schneiderian membrane is thickened and congested, especially in damp weather; breathing is impeded; smell is impaired; the voice is altered; there may be deafness, and sometimes even cerebral symptoms. The tumour may be seen by throwing light into the nostril, or by using the laryngoscope to examine the posterior nares; or it may have advanced so far as to have produced outward deformity of the nose.

Treatment.—Tonics and astringent lotions may be tried at first, but they seldom effect a cure. Mr. Bryant speaks highly of the value of tannin as a snuff. If these measures fail, the growth must be removed, either by the polypus forceps or by ligature.

The patient should be seated in a low chair, with his head thrown back. The forceps are then introduced, the polypus seized, and twisted from its attachment. This process may be repeated until the nostril is entirely cleared. This method of treatment is best suited to the gelatinous polypus.

The ligature is more applicable to the fibrous growth. A noose of twine is passed through the nose, by means of a double canula or bougie, looped around the tumour, and then tied tight.

CANCER OF THE NASAL CAVITY.

Besides the degenerated fibrous polypus which, as we have said, often assumes a malignant character, the nasal cavities are sometimes the seat of medullary cancer. This disease is not unfrequently met with in children. It may either originate in the nose, or spread to it from the antrum. It grows rapidly, expands the nasal bones, and gives rise to great deformity. It is attended by a profuse and offensive discharge.

Treatment.—The only treatment is extirpation, and even this, at the best, is not likely to do more than prolong life for a short time.

OZÆNA

is the name given to a discharge from the nostrils of a peculiarly foetid and offensive nature. It often manifests itself in persons of a scrofulous habit. It may also arise from syphilis, or from the abuse of mercury.

In some cases there is simply a thickened and unhealthy state of the mucous membrane; in other cases there is ulceration; and sometimes even the bones are affected.

Treatment.—The first thing is to examine the nose by reflected light, and to ascertain, as far as possible, the state of the mucous membrane, and the source of the discharge. It may depend upon the presence of a polypus, or of a foreign body. If the lining membrane is thickened or ulcerated, the nose should be frequently steamed, and syringed with astringent, stimulant, or disinfectant lotions (F. 13, 24, 9), and the ulcerated spots touched with a pencil of caustic. Nothing is better, as a wash, than a liberal use of warm water, to which a little of the chloride of lime, or of soda, has been added. Under any circumstances, it is of the greatest importance to study the general health, particularly if there is a strumous tendency or a syphilitic taint.

ABSCESS OF THE ANTRUM.

The lining membrane of the antrum is liable to become inflamed from injury, or from the irritation of carious teeth, or from other causes. Such inflammation is very prone to run on to suppuration.

Symptoms.—There is severe, deep-seated, throbbing pain in the part, and the soft tissues become swollen and tender. There is a good deal of constitutional disturbance. If relief is not afforded, the walls of the cavity become distended, the nose is obstructed, and the face becomes deformed.

The *treatment* consists in allaying inflammation by local and constitutional measures, in the hope of anticipating suppuration. When pus has been formed, it sometimes escapes through the nose. Much more frequently, however, an opening has to be made into the antrum, to give vent to the matter. This may be done either by extracting a tooth, and pushing a trochar through its socket into the inflamed cavity; or by perforating the external wall of the antrum, in the situation of the canine fossa.

TUMOURS OF THE UPPER JAW.

The upper jaw is liable to be the seat of tumours of various kinds. Of these the commonest are the fibrous, the myeloid, and the medullary. They appear to originate in the gum, the alveoli, or the antrum. As they grow, the bones become expanded. The swelling projects outwards on the face, backwards towards the fauces, inwards towards the nose, and upwards towards the orbit. Swallowing is impeded, smell is impaired, vision is distorted, and the face is terribly disfigured.

At first it is difficult to give any opinion as to the precise nature of the tumour. If, however, it grows slowly, our diagnosis will be more favourable; and less favourable if it grows quickly. The rapidity of growth is generally in direct proportion to the malignancy. Dentigerous cysts—cysts containing undeveloped teeth—are occasionally met with in this situation.

Treatment.—The only remedy is extirpation—removal of the upper jaw. Though this is a formidable operation, yet the immediate result is almost invariably good. The skin may be reflected, and the tumour exposed, in various ways. Perhaps that which leaves the least deformity is the one recommended by Sir Wm. Fergusson. The knife is carried through the middle line of the upper lip, and the nostril is entered. In some cases this gives sufficient space. If, however, more is wanted, the incision may be continued round the ala, and up the side of the nose. If need be it may be turned at right angles along the lower border of the orbit.

If the whole of the upper maxilla has to be removed, the first step is to draw an upper incisor tooth on the affected side, and divide the alveolus and the palate-plate with a fine saw, or with bone-pliers introduced into the nostrils. The internal angle should then be similarly notched and cut through, and subsequently the outer angle and the zygomatic process. The bone must then be turned out with the "lion forceps," the soft tissues divided with a scalpel, and the wound closed with interrupted sutures.

TUMOURS OF THE LOWER JAW

are much the same in their characters as those which are met with in the superior maxilla. The most common varieties are the fibrous and the fibro-cystic. The soft cancer is less often seen. Tumours are generally situated between the angle and the symphysis; but they may occur anywhere, and they have been known to occupy the whole extent of the jaw.

Treatment.—Complete removal of the tumour, and of the portion of bone connected with it, is the only remedy. An incision should be made along the lower border of the bone, and the soft tissues reflected, so as to expose the growth. The Hey's saw should then be applied on each side of the tumour, the jaw grooved, and the division completed by the cutting-pliers; or the bone may be divided from within outwards by means of the chain-saw. When this has been done, the tumour should be carefully dissected from the soft parts on its inner and under surfaces. In performing this operation the "lion forceps" will be found of great service.

EPULIS

is the name given to a tumour which springs from the alveolar processes, and from the periosteum covering them. It is more often seen in connexion with the inferior than with the superior maxilla. It forms a smooth, rounded, or lobulated tumour, covered with the mucous membrane of the gum. It is firm, or semi-elastic to the touch. As it grows it loosens and displaces the teeth. Its intimate structure varies considerably. Sometimes it is a simple fibrous tumour; sometimes it is a round-celled sarcoma; sometimes a myeloid. At first it is benign; but if it is allowed to remain, it is apt to ulcerate, and exhibit something of a malignant aspect and character.

Treatment.—The tumour should be removed, and the portion of the alveolar process from which it springs should be taken away with the gouge, the cutting-pliers, or a fine saw. Unless this is done, the growth is almost certain to return.

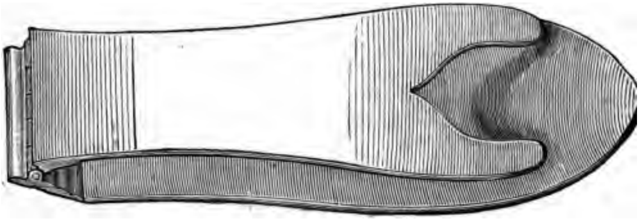
RANULA

is the name given to an encysted tumour which is apt to form beneath the tongue. It depends upon distension of one of the mucous follicles, which are numerous in this situation; occasionally it may be due to obstruction of the ducts of the salivary glands. The contained fluid is clear, viscid, and albuminous.

Treatment.—The cyst may be simply punctured; or a small portion of the cyst-wall may be cut off; or a seton may be passed through it; or it may be laid open and filled with lint, according to its size, and the circumstances of the case. The spatula represented in Fig. 88 will be found very useful in these cases, as well as in many others, by enabling the surgeon to hold up the tongue while he operates in the sublingual space.

There is another class of cases to which the name ranula is applied, but which are in truth of a different, and more formidable kind. Here the swelling is situated between the tongue and the jaw, and becomes prominent in the upper part of the neck. These tumours contain a thick, gritty, putty-like substance composed of crystals of cholesterine, oil-globules, and the débris of epithelial scales. In fact they are of the nature of sebaceous cysts (see Fig. 2). The best way of treating these tumours is to lay them open from the mouth, scoop out the contents, and fill the cavity with lint. If need be, a counter-opening should be made in the neck. To dissect out the cyst is an unnecessary proceeding, and one which is not altogether free from danger.

Fig. 88.



Tongue spatula.

SALIVARY CALCULUS.

It sometimes happens that a deposit of earthy salts from the saliva—composed chiefly of phosphate of lime—takes place in one of the salivary glands, or in one of the ducts. Such a concretion is known as a salivary calculus. (Fig. 89.) These concretions vary in size from a pin's head to a hazel nut, and not unfrequently they form around some foreign body, such as a morsel of woody fibre.

Fig. 89.

Salivary calculus.

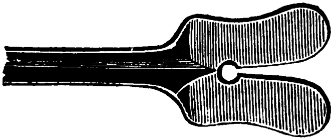
Treatment.—If a salivary calculus can be felt either by the finger, or by a probe passed along the duct, an incision should be made, and it should be removed with a forceps. If it is so small as to elude the grasp of the instrument, it will be washed out at the opening by the discharge of saliva.

TONGUE-TIE.

The commonest affection of the tongue, about which the surgeon is consulted, is what is known as tongue-tie. Here the *frænum linguæ* is too short, or comes further forward than it should, and thus restrains the movements of the anterior portion of the organ. The infant cannot put out its tongue or use it in sucking; and, if the defect is allowed to continue, it seriously interferes with the distinctness of the patient's articulation.

The *treatment* is simple and effectual. The infant's mouth being held open, the surgeon takes the *frænum* between his left forefinger and thumb, puts it gently on the stretch, and snips it with a blunt-pointed pair of scissors; or the tongue may be pressed upwards, and the bridle made tense, by means of the little instrument which has been devised for the purpose (Fig. 90). The incision need not be deep. In most instances an eighth of an inch will suffice, and care should be taken to direct the point of the scissors downwards, so as to avoid the ranine arteries. Trifling as this operation is, it has sometimes been followed by severe, and even fatal, hæmorrhage. Many children are thought by their parents to be tongue-tied, when in truth, there is no such defect. The surgeon should therefore be on his guard, and not undertake the operation without good reason.

Fig. 90.



Instrument for tongue-tie.

ULCERATION OF THE TONGUE.

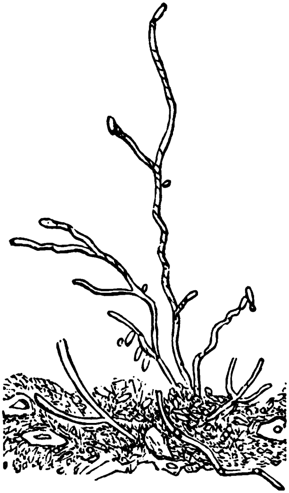
The tongue is liable to be affected with ulceration of various kinds—*simple*, *syphilitic*, *aphthous*, and *cancerous*. Of the last we shall speak in the next section.

The *simple* ulcer may arise either from internal or external causes. When it arises from internal causes it is due to derangement of the stomach, and is termed dyspeptic; when it is due to external causes it will probably be found to have been produced by a jagged tooth or an accumulation of tartar. The edges of a simple ulcer are rounded, the surface is yellow, the base is soft. The tongue is coated, and the breath offensive.

Syphilitic ulceration occurs under three forms:—(1) cracks and fissures along the sides of the tongue; (2) superficial, flat, oval ulcers; (3) deep ulceration, the result of the softening, and discharge of a gummy tumour in the substance of the organ.

Aphthous ulcers are met with in infants, in old persons, and in the last stages of some wasting complaints—in fact wherever there is great debility. They constitute what is popularly called "the thrush." They are due to the development of a parasitic fungus—the oidium albicans (Fig. 91), which destroys the epithelium upon which it grows, and then the exposed mucous membrane ulcerates. The disease first appears on the tongue, or on the lining membrane of the mouth, as small white flakes, like morsels of curd, for which indeed it is often mistaken. These flakes should not be picked off, for, if this is done, they are soon reproduced. To deal with them successfully we must remove the morbid condition, which favours their development.

Fig. 91.



Oidium albicans, × 300.

Treatment.—In the case of a dyspeptic ulcer the *primæ viæ* should be regulated by alteratives, and the general health estalished by tonics. The patient should at the same time confine himself to a liquid and bland diet. If the ulcer is due to local irritation, the source of such irritation ought at once to be removed, and the disease treated as in the foregoing case.

The surface of the ulcer should be lightly touched with lunar caustic, and the mouth rinsed with stimulating, astringent, or disinfecting washes. The patient should at the same time be desired to abstain from talking. In fact, everything should be done to keep the tongue at rest.

If the ulceration is syphilitic the same local measures should be adopted, and the patient should, in addition, be treated with mercury or iodide of potassium.

In true aphthous ulceration our aim must be to destroy the parasitic fungus by lotions of sulphite of soda (ʒj to ℥j of water) or carbolic acid, while we rectify the secretions of the mouth by alteratives and tonics. In infants, a well-regulated manner of nursing and strict attention to cleanliness, are often all that is needed to effect a cure.

EPITHELIOMA OF THE TONGUE

may either commence as a superficial blister or crack, or as a lump in the substance of the organ. If it begins as a blister or crack, it rapidly runs into ulceration. A foul and offensive sore is formed with a sloughy surface, ragged edges, and a hardened base. There is acute, darting pain. The breath becomes fœtid, there is profuse salivation, and the submaxillary, sublingual, and lymphatic glands become enlarged. Gradually the general health suffers, and the patient at length dies, worn out by irritation and exhaustion. When the disease begins as a deep-seated lump, it draws the tissues down to itself, and forms a hard mass. There is little or no ulceration, but the other features of the case are much the same as those of the preceding variety. It was this class of cases which used to be called scirrhus. But it is now known that any other form of cancer except epithelioma is extremely rare in the tongue.

Treatment.—Early and complete removal is the only remedy which holds out a hope. The disease may be taken away with the knife, the écraseur, the galvano-cautery, or the ligature. If the knife is used, the hæmorrhage is generally so profuse that it is not advisable to give chloroform. But if any of the other methods are employed, the patient can have the comfort of an anæsthetic. It is but seldom that the ligature is now used in these cases. The presence of a slough in the patient's mouth for a few days after it has been applied is a great objection to it. If the base and sides of the tongue are freed, or if the lower jaw is divided, any part of the organ may be brought within the loop of the écraseur; and if this is very slowly tightened, it gives all the advantages of the ligature without its disadvantages. The characteristic microscopical appearances of epithelial cancer are seen in Fig. 10.

If an operation, even of a palliative kind, is out of the question, much may be done by the judicious use of conium, hyoscyamus, and morphia, to alleviate the patient's sufferings.

Though cancer of the tongue is very rapidly fatal—the average duration of life being only fourteen months—yet statistics show that the balance is considerably in favour of cases that have been submitted to operations. This I have shown in detail in my treatise on the Diseases of the Tongue.

CLEFT PALATE

signifies a congenital fissure in the palate, the result of defective development. The cleft varies greatly, both in extent and width, in different cases. It may be confined to the tip of the uvula, or it may sweep through the whole arch of the soft and hard palate, and be associated with hare-lip. Sometimes it is quite narrow and a mere slit, sometimes it is nearly an inch in breadth. In a severe case food regurgitates by the nose, causing great difficulty in rearing the infant, and great inconvenience in after life. The patient's speech, too, will be nasal and indistinct.

Treatment.—If the soft tissues are abundant, and the patient's health good, an operation may be undertaken with the view of remedying the defect. If the soft palate alone is cleft, it may be united without any great difficulty. If the hard palate is only slightly fissured, the surgeon may be able to close the soft tissues over it. But if there is a large gap, the patient must be contented to wear an artificial palate. When the soft palate has been united, a plate will more easily be worn in the aperture which remains in the hard palate.

The operation of *velosynthesis* or *staphyloraphy* consists in paring the edges of the cleft, bringing the soft tissues together, and keeping them in that position until they have united. In order to allow the parts to come together more easily, and to prevent traction upon the stitches, Sir Wm. Fergusson divides the levator palati and the palato-pharyngeus muscles on both sides at the outset of the operation. Others prefer making an incision through the soft parts on each side of, and parallel to, the line of union. The sutures used should be of fine silk, or catgut, or silver wire; and if they cause no irritation they should be allowed to remain for a week.

The earlier this operation is undertaken the better chance will the patient have of speaking clearly and distinctly. Formerly it was usual to defer it until the child was of sufficient age to exercise some degree of self-control. For this reason it was seldom undertaken before the age of puberty. Lately, however, operations have been performed at a much earlier age, both with, and without, the aid of chloroform. In these proceedings, Mr. *Thomas* Smith's gag will be found of great service.

ACUTE INFLAMMATION OF THE TONSIL

(*Tonsillitis, cynanche tonsillaris, quinsy*) is attended by urgent symptoms, and a high degree of fever. There is rapid swelling, with pain which extends over the side of the face and neck. Usually one tonsil is solely or chiefly affected. If both are involved, swallowing becomes difficult, speech is thick and indistinct, and breathing is somewhat impeded.

The *treatment* should be active, and a brisk purgative should be given, to be followed by an antimonial or saline mixture. Locally, the throat should be well steamed; and leeches, mustard poultices, or fomentations applied externally. In some parts of the country there is a popular notion that a poultice made of quinces is a cure for the disease. Hence they call that fruit the "quinsy apple." No doubt the belief has arisen from the similarity of the names, though the etymological derivation of the words is quite different; and the efficacy of the remedy does not consist in the particular fruit, but in the warmth and moisture of the application. Much relief may sometimes be given by scarifying the part. If there is reason to think that matter has formed, the tonsil should be punctured—the point of the knife being directed towards the middle line of the body.

CHRONIC ENLARGEMENT OF THE TONSIL

is usually the result of repeated attacks of tonsillitis, but sometimes it is brought about by a slow and chronic inflammation. The latter is often the case in young persons of a scrofulous habit.

The tonsils become enlarged and hardened. There is slight difficulty in swallowing, some indistinctness of articulation, and perhaps deafness. The patient, moreover, is constantly liable to acute attacks of sore throat supervening on the chronic state.

The *treatment* consists in improving the general health, more particularly if the patient is young and strumous. Locally, the disease should be treated with gargles of alum or sulphate of zinc, or painted with a solution of nitrate of silver, or a mixture of tincture of steel and glycerine. If these means are fairly tried and found ineffectual, a portion of the tonsil must be removed.

EXCISION OF THE TONSIL.

Though several ingenious instruments under the name of tonsil-guillotines have been devised, I believe the method so tersely *described by Celsus, hamulo excipere et scalpello excidere*, has never been superseded, and that the best way of performing this operation is with a long hooked forceps and a blunt-pointed bistoury. The blade of the knife should be wrapped round with a strip of plaster or lint, so as to leave only about an inch at the end exposed. The tonsil is seized with the forceps, and drawn gently forwards and inwards towards the middle line. The bistoury is then introduced under it, and a slice is taken off, cutting from below upwards. In excising the right tonsil, the surgeon may find it convenient to stand behind his patient. A pair of curved, blunt-pointed scissors, or the wire écraseur, may sometimes be used with advantage instead of the knife. The bleeding is generally stopped without difficulty by washing out the mouth with cold water. The cicatrization and contraction, which follow the removal of even a small slice of the tonsil, generally produce the desired effect. If need be, the operation may be performed upon both tonsils at the same time.

STRICTURE OF THE ŒSOPHAGUS

may be either *spasmodic and temporary*, or *organic and permanent.*

Spasmodic stricture is generally met with in nervous and hysterical young women. The treatment should consist in strengthening the constitution by those general remedies which have been described in speaking of hysteria (see p. 89). Any local measures that may be adopted should be of the mildest kind, such as may satisfy the patient, without directing too much attention to the part.

Organic stricture may be either simple or malignant.

Simple stricture may be the result of spontaneous inflammation, or of syphilitic ulceration, or of injury sustained by swallowing strong acids, alkalies, boiling fluids, &c. Such strictures have a fibrous texture, and are prone, in the course of time, to assume the characters of epithelioma.

Malignant stricture is caused by the presence of a cancerous tumour in the substance of the œsophagus, or in its immediate neighbourhood.

Symptoms.—There is difficulty in swallowing solid food. This difficulty is permanent, goes on gradually increasing, and is evidently not dependent upon pressure upon the œsophagus from without. There is pain in the neck and shoulders, and retching, with regurgitation of food.

The most common seat of stricture is at the junction of the pharynx and œsophagus, opposite the cricoid cartilage.

The *treatment* of organic stricture consists in passing œsophagus-bougies, so as to dilate the passage and keep it open. In spite of this, the disease will probably get gradually worse, until, at length, it will become impossible to pass even the smallest gum-catheter. The patient may then be kept alive for a few days or weeks by nutritive enemata, or by the performance of gastrotomy; but death by starvation is inevitable.

In stricture of the œsophagus, in wounds of the throat, in cancer of the pharynx and tongue, it is often necessary to feed the patient by means of the stomach-pump.

Use of the stomach-pump.—The patient should be seated in a chair with his head thrown back, and his mouth open. The tube of the stomach-pump should be oiled, and slightly curved at the end. It should then be introduced into the mouth, and directed down the pharynx; at the same time the patient's head should be gently bent forwards, so as to throw the cervical and dorsal vertebræ into one equal curve. The tube should then be pushed on steadily into the stomach. The chief dangers are lest the point should pass into the larynx, or the coats of the stomach be injured. If the patient is insensible or lunatic, the wooden gag must be placed between his teeth to keep the mouth open.

If our object in using the pump is to remove noxious matters from the stomach, warm water should be injected each time that suction is made, care being taken to inject always rather more than is withdrawn. It is in cases of alcoholic or narcotic poisoning that the pump is generally used to empty the stomach.

FOREIGN BODIES IN THE PHARYNX

may destroy life in two ways—either by pressing on the glottis, and thus causing spasm and suffocation; or by leading to ulceration and perforation of the walls of the pharynx.

Treatment.—The surgeon should explore the fauces and pharynx with his finger. If anything can be felt, it should be withdrawn with the nail, or seized with a forceps. If nothing can be felt, the long, curved scissor-forceps should be introduced, in the hope of finding the foreign body in the lower part of the pharynx; or an emetic may be given with the view of dislodging it upwards; or it may be pushed on into the stomach by cautiously passing a bougie. But if it can be avoided, this last plan ought not to be adopted in the case of hard, angular bodies, such as bones, or the plates of artificial teeth.

FOREIGN BODIES IN THE LARYNX, TRACHEA, AND BRONCHI.

Foreign bodies—such as beads, pins, coins, morsels of food, &c. —are sometimes drawn from the mouth into the larynx by a sudden act of inspiration. They may lodge in the rima glottidis, in the ventricles of the larynx, in the trachea, or in the bronchi, more particularly in the right bronchus.

When the rima glottidis is obstructed, the patient is seized with a sudden difficulty in breathing, his face becomes livid and swollen, and he speedily falls down insensible and moribund.

When the foreign body is situated either in the folds of the larynx, or in the trachea, or in the bronchi, the leading symptom is violent, suffocative, spasmodic cough. When in the bronchi, this cough comes on at intervals ; when in the larynx it is almost constant. By the laryngoscope, or by auscultation and percussion, the position of the foreign body may sometimes be ascertained with tolerable accuracy. After it has been lodged for some time it will probably give rise to secondary symptoms of an inflammatory kind.

Treatment.—When the rima glottidis is obstructed, the treatment must be immediate. The trachea should be opened without delay, and a probe passed upwards to dislodge the foreign body; and, if need be, artificial respiration must be practised.

When the foreign body is impacted in the ventricles of the larynx, it may perhaps be removed by the help of the laryngoscope and a suitable forceps. If it has made its way into the trachea or bronchi, tracheotomy must be performed, and an attempt made to remove it by inverting the patient, or by introducing a long scissor-forceps.

But it is highly probable that, after all, we shall be unable to dislodge or remove the foreign body. In such a case it will either become encysted and give no further trouble, or the patient will speedily die, worn out by the irritation and subsequent inflammation which it occasions.

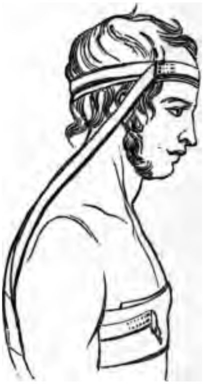
WRY-NECK (TORTICOLLIS)

is a disease which consists in a permanently contracted state of the sterno-mastoid muscle of one side. Sometimes the trapezius is involved as well; and in rare cases both sides are affected, though in different degrees. The origin of the disease seems to be a faulty condition of the spinal accessory nerve. This appears to be sometimes congenital; but more often it is induced in early life by the irritation of a common cold and swelled face, or of enlarged cervical glands. The head is drawn downwards and sideways, while the face is turned towards the opposite side.

Treatment.—A bandage, or a mechanical appliance, should be worn, so as to try and draw the head into its proper position. If this produces no effect, the sternal and clavicular attachments of the sterno-mastoid muscle must be subcutaneously divided, and the treatment by bandages and mechanical means continued.

Bandage for wry-neck.—A broad rib-bandage is first applied to the chest, immediately below the armpits. An ordinary roller is then fixed by a few circular horizontal turns round the head, and secured by pins over the temple on the side towards which the surgeon desires to draw the head. The roller is then carried downwards and backwards, and passed under the axilla of the same side, and fastened in front to the rib-bandage. A cushion or pad should be placed in the armpit, so as to prevent the roller from irritating the skin.

Fig. 92.



Bandage for wry-neck.

Dr. Little recommends that, in young subjects, a strip of adhesive plaster should be passed round the forehead and another round the waist; and that then a ribbon should be attached to the plaster immediately above the ear on the unaffected side, carried diagonally across the chest to the opposite side of the waistband, and there fastened.

Such bandages as these are useful not only in cases of spasmodic contraction of the sterno-mastoid muscle, but also in certain operations, and in burns and wounds about the neck.

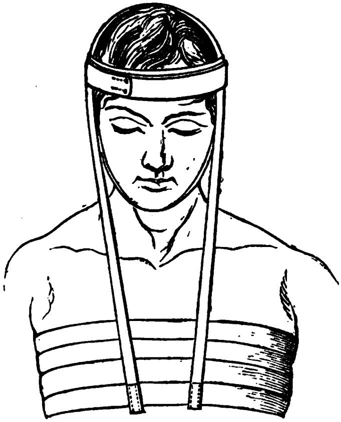
WOUNDS OF THE THROAT

are generally inflicted with a murderous or suicidal intent. In the latter case the prognosis is particularly unfavourable, on account of the mental condition of the patient. Any part of the throat may be wounded, and the cut may be either superficial or deep. If the larynx or trachea alone is wounded, recovery will probably take place, but if the large vessels have been divided, death will be speedy and inevitable.

Treatment.—Our first care is to arrest hæmorrhage. The wound should be cleaned, coagula removed, and the bleeding stopped by ligatures, pressure, or styptics. Our next object is to facilitate breathing by keeping the trachea in position—supposing it to have been wholly or partially divided. The patient should be laid in bed with his head bent forwards, so as to bring the edges of the wound into apposition.

In such injuries we endeavour, as far as possible, to adjust the position of the patient by means of pillows; but if he is refractory, and milder measures fail, we have recourse to the following contrivance:—A bandage is first applied round the chest, immediately below the armpits. An ordinary double-headed roller is then passed under the chin, carried up on each side of the head, crossed upon the vertex, brought down equally on both sides, and firmly fastened in front to the broad bandage which encircles the chest. A few horizontal turns may then be made round the forehead, so as to fix the bandage. (Fig. 93.) Sometimes before the roller is applied a night-cap is placed on the patient's head. This is not a necessary part of the bandage, but it serves to make it more secure. By these means the head can be bent upon the chest, and retained at any angle that may be thought proper. No plasters or sutures should be applied to the incision, except when the trachea is completely divided, and it is necessary to preserve its continuity. The wound should be lightly covered with water-dressing.

Fig. 93.



Bandage for wounds of neck.

If the patient is unruly, and tries to tear open the wound, he must be restrained by a strait-waistcoat.

When the larynx or trachea have been freely opened, or when the œsophagus has been wounded, it may be necessary to feed the patient by means of the stomach-pump. The tube should be introduced through the mouth two or three times a day.

Every precaution should be taken to prevent inflammation of the larynx or lungs. The patient's throat should be lightly covered with flannel, and he should breathe a warm, moist atmosphere of about 80° Fahr. If there are symptoms of bronchitis or pneumonia, sinapisms or turpentine stupes should be applied to the chest, while stimulants and expectorants are administered.

In every case of "cut-throat" the surgeon should be careful to note down without delay the exact direction, situation, and extent of the wound, together with all the other particulars, as he may have to give evidence in a court of law.

BRONCHOCELE

(or goître) is the name given to an hypertrophy of the thyroid gland. Such hypertrophy is simple in its origin, but it may become either cystic or malignant. The disease is endemic in some parts of Great Britain —in Derbyshire, for example. But it is in the Alpine valleys that it is most frequently seen, and that it attains its greatest size. The allusion which Juvenal makes to the *tumidum guttur* is well-known (xiii. 163). In Switzerland and Italy it is often associated with the degraded mental and physical condition to which the term *cretinism* is applied. In this country it is only seen in its milder forms.

Bronchocele has been referred to a great variety of causes. Some have thought that it is due to the peculiar waters of the district; but it is much more probable that the damp and stagnant air of a valley, the want of sunlight, marriages of consanguinity, and the conditions of hardship and privation under which the sufferers too often live, combine to produce the more aggravated cases.

It is more common in women than in men, and is particularly apt to show itself about the age of puberty.

The gland enlarges gradually without pain. At first it occasions only a slight deformity; but as it increases, it gives rise to giddiness, headache, and difficulty of breathing and swallowing. If a part only of the gland is enlarged, it may be mistaken for aneurism of the carotid. In making the diagnosis, it is of great importance to remember that a bronchocele rises and falls with the trachea in the act of deglutition.

As it grows, cysts may become developed in the tumour, and even attain a considerable size; or it may undergo a cancerous degeneration.

There is a remarkable prominence of the eyeballs—known as proptosis or exophthalmos—which is frequently associated with goitre. This condition seems to depend upon hypertrophy of the adipose tissue of the orbit, and to arise from a want of tone and strength in the vascular system, for it is invariably ushered in and accompanied by anæmia. Sometimes the protrusion becomes so great that the lids are unable to cover the globes, and the cornea suffers severely from exposure to wind, dust, &c. I have seen a young woman, with a well-marked goitre, who had lost both her eyes by *suppurative* inflammation produced in this way.

Treatment.—In the case of a simple bronchocele of moderate size and recent growth, it is generally sufficient to place the patient in a pure air—if possible, at the seaside—to regulate the health, to apply the tincture of iodine over the tumour, and to give iodide or bromide of potassium internally, with iron, quinine, or other tonics. (F. 47, 50, 52.) A mixture in equal parts of the ung. hyd. and the ung. iodi. may, as a change, be substituted for the tinct. iodi; or the ung. hyd. biniodidi may be occasionally and cautiously applied.

If these means fail, and the tumour is growing so as to become dangerous to life, setons may be passed through it in various directions; or the arteries leading to it may be tied; or the skin may be reflected, and portions of the gland removed with the knife, the écraseur, or the ligature. But these operations are attended by much risk, in consequence of the hæmorrhage which may ensue; and the benefit that is likely to arise from them is very uncertain. Relief may sometimes be afforded, or dangerous pressure removed, by division of the sterno-mastoid muscles. If cysts have formed, they may be punctured, or tapped and injected with a solution of iodine, or setons may be passed through them. But, on the whole, the treatment of bronchocele by operative means is very unsatisfactory.

PARACENTESIS THORACIS.

The surgeon is sometimes required to make an opening into the chest in cases of pleurisy and empyema. The operation is called *paracentesis thoracis*, or *tapping the chest.*

The conditions which demand this operation are all attended by somewhat similar symptoms. The chest is dull on percussion, and distended. The ribs are unusually far apart, and appear to be depressed in consequence of the bulging of their interspaces. The patient has difficulty in breathing, and is unable to lie on the affected side.

Sometimes the fluid which is drawn off is serous—pleuritic effusion (*hydrothorax*); sometimes it is purulent (*empyema*).

As a general rule, the space between the fifth and sixth, or the sixth and seventh ribs, and a little in front of the angles, is the most eligible spot for operation. An incision about an inch long should be made through the skin over the lower rib of the interspace chosen. The skin should then be drawn up, and a trochar and canula thrust sharply into the chest at the lower part of the interspace. The operation is performed in this way to avoid the vessels which lie at the upper part of the interspace, under cover of the superjacent rib. Various instruments have been devised for drawing off the fluid without permitting the entrance of air. The aspirator promises to be very useful in these cases. As soon as the canula has been withdrawn, the skin returns to its original situation and closes the opening. The superficial incision should be covered with a piece of plaster.

If the fluid is serous, the greatest care should be taken to avoid the entrance of air; but if it is purulent, a free opening and the introduction of a drainage-tube, is probably the best mode of treatment.

HYPERTROPHY OF THE BREAST

is occasionally met with in pregnant women. In girls it sometimes occurs about the age of puberty. One breast may be affected, or both. The whole gland slowly enlarges. There is no pain, unless it be of an hysterical, or a neuralgic kind. The tumour feels firm, and is free from tenderness. It may attain an enormous size and weight, so as to be quite a burden. If it is not associated with pregnancy, there is generally some irregularity of the menstrual discharge.

The treatment consists in improving and regulating the general health by ferruginous tonics and change of air, in giving saline aperients, in rubbing the breast gently with stimulating ointments and liniments, and in supporting it with a bandage. As a last resource in extreme cases excision has been practised.

Bandages for the Breast.—In some cases the breast may be sufficiently supported by a large handkerchief, folded in the form of a broad cravat, and passed under the affected organ—the ends being brought round, one across the back and the other across the chest, and tied on the opposite shoulder.

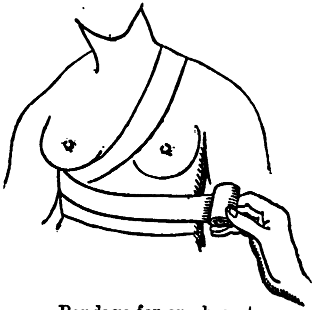
A more efficient bandage, both for supporting and also compressing the breast, may be made by taking a piece of calico, about a foot wide and a yard and a half long, and tearing it down the middle from each end to within six or eight inches of the centre. The central portion is applied over the affected organ, and the two lower tails are carried horizontally round the body, one in front and the other behind, and tied at the opposite side. The two upper tails are then tied round the neck, or they may be conducted, one under the axilla of the affected side and the other over the opposite shoulder, and fastened behind.

Again, one or both breasts may be bandaged by means of an ordinary roller. In this case the roller ought to be of full length, and at least as wide as a "leg-bandage."

When one breast only has to be bandaged the surgeon begins by taking a turn round the body so as to fix the end of the roller. He then conducts it obliquely from below upwards across *the lower margin* of the affected breast, over the opposite shoulder, and so round to the point from which he started. He then makes a circular turn round the body, to fix the oblique one and prevent it from slipping; after which he carries the bandage for the second time obliquely across the chest, rising a little higher than before, and covering a little more of the breast than he did with the first fold. He then makes another circular turn round the body to fix the second oblique fold, and then a third oblique one, and so on until a sufficient number of turns have been applied to support or compress the breast, according to the purpose for which the bandage is employed. (Fig. 94.) Or the oblique turns may be placed immediately over one another, and secured by pins, or by stitches; omitting all the circular turns round the body except the first, which is necessary to secure the commencement.

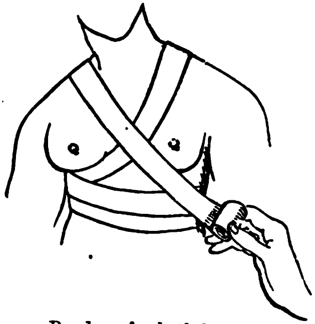
When both breasts have to be bandaged the surgeon fixes the roller and makes his first oblique turn exactly as in the foregoing case. But his second oblique turn he makes from above downwards over the other breast, and thus he goes on, carrying the oblique turns first over one breast, and then over the other, until he has afforded the required amount of support to both. (Fig. 95.)

Fig. 94.



Bandage for one breast.

Fig. 95.



Bandage for both breasts.

ACUTE INFLAMMATION OF THE BREAST.

The breast is liable to be acutely inflamed from blows and other external injuries, but it still more often becomes so spontaneously during lactation. The inflammation may take place either in the subcutaneous cellular tissue, or in the substance of the gland, or in the cellular plane which is interposed between it and the pectoral muscles. It often happens that these different parts are all simultaneously or consecutively affected.

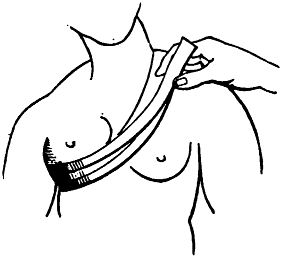
The symptoms of "milk abscess" are well marked. There is a high degree of pyrexia. The breast is swollen, hard, hot, red, painful, and exquisitely tender to the touch. The secretion of milk is generally stopped; if, however, it continues it should be drawn off by means of a breast-pump. The child should only be allowed to suck the sound breast.

Treatment.—The constitutional treatment should be mildly antiphlogistic. The breast should be well supported with a bandage or handkerchief. If the patient is robust, and the inflammation very acute, leeches should be applied. In all cases poultices or fomentations must be constantly used; and when resolution has begun to take place the gland should be gently rubbed with some simple ointment or liniment.

If suppuration occurs, the matter should be let out as soon as fluctuation can be detected. The opening should be made at the most dependent point. If the matter burrows, a counter-opening will be required, and in such a case a small drainage-tube may sometimes be introduced with great advantage. If sinuses remain, they should be dressed with stimulating lotions, and their sides kept at rest, and in apposition, by equable pressure. This may sometimes be effected by bandaging the breast in the manner already described, or by covering them with pads of lint and strapping the breast with strips of plaster.

Strapping the breast.—When our object is merely to support the breast the strapping may be applied in the following manner:—The surgeon takes a sufficient number of strips of adhesive plaster, about an inch and a half broad, and long enough to pass over the breast and obtain a firm purchase at both sides. He then proceeds to apply the strips in regular order, laying the first on the patient's side, bringing it up under the breast, and carrying it towards the opposite shoulder. The others he then applies one above the other until he has placed a sufficient number to effect the object he has in view. (Fig. 96.)

Fig. 96.



Strapping the breast.

When the strapping is used to compress the breast it is better to lay the alternate strips of plaster crosswise. When the whole organ has been covered in this way it may be necessary to stretch a few pieces of plaster in various directions, wherever there is a chink through which the skin can protrude, or where the part seems to require additional pressure.

"Milk abscess" is generally associated with an exhausted and debilitated state of health. As soon, therefore, as suppuration has taken place all lowering measures should be abandoned, the patient should have a nutritious diet, with a moderate allowance of stimulants. At the same time she should take the mineral acids and bark, or other strengthening medicines. (F. 26, 27, 28.)

The chronic mammary or adenoid tumour is not unfrequently met with, and may easily be mistaken for a malignant growth. It generally occurs in young women under thirty, who are otherwise in good health; and it may often be traced to some local source of irritation, such as a blow. A portion of the gland, generally at the circumference, enlarges; there is a partial hypertrophy. A tumour is formed which is hard, lobulated, and moveable. It is usually free from pain or tenderness. Sometimes it feels nodulated, like a bunch of grapes. Along with the enlargement of the gland-structure, the fibrous septa become hypertrophied, and it is very common to find cysts developed in the tumour, either from the areolar interspaces, or from obstruction of the milk-ducts (sero-cystic tumour). The chronic mammary tumour is distinguished by the following characters:—It does not affect the axillary glands. It does not implicate the skin. It does not impair the general health. It may remain stationary for years, and then gradually disappear; or, after a long period of quiescence, it may suddenly begin to increase rapidly in size.

Its minute structure consists of the gland tissue greatly hypertrophied, mixed with fibrous and areolar tissue.

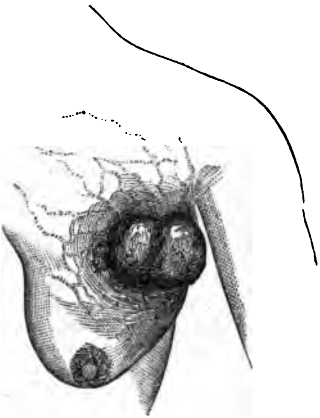
The *treatment* consists in regulating the general health, and endeavouring to bring about absorption by internal remedies, such as bromide or iodide of potassium (F. 47, 48, 50), or corrosive sublimate (F. 44); or by external applications, such as iodine tincture, or by pressure applied by strapping the breast in the manner above described either with common diachylon, or the emp. belladonnæ, or the emp. ammoniaci c. hydrargyro. If there is neuralgic pain, anodyne liniments should be used, and sedatives or narcotics given internally. If there are occasional attacks of inflammation, a few leeches will be found beneficial. If the tumour is growing rapidly, and threatening to ulcerate, it should be excised. In doing so it is not necessary to remove the whole gland, but only that portion of it which is diseased.

MALIGNANT TUMOURS OF THE BREAST.

Besides the tumours of which we have already spoken, the breast is sometimes the seat of morbid growths of a fatty, fibrous, sarcomatous, or syphilitic kind. But by far the greater number of tumours in this situation belong to the carcinomatous class. They are chiefly of the scirrhous and medullary varieties. The disease is always primary, and is generally confined to one breast. Sometimes it occurs as an infiltration, but more often as a circumscribed tumour.

Scirrhus is remarkably common in the breast between the ages of forty and fifty—that is, at the "change of life." It begins as a small, hard tumour near the centre of the gland. At first it is moveable, but soon it becomes adherent to the skin in front and to the pectoral muscle behind (Fig. 97). The nipple is retracted. There is pain of a darting character. The axillary glands become enlarged. The skin ulcerates, and an offensive, exhausting discharge commences.

Fig. 97.



Malignant tumour of the breast.

Along with this the general health usually suffers much. The system is deeply affected by the local disease, constituting what used to be called the cancerous cachexia. The growth of a scirrhous tumour of the breast is slow, but sure. According to Sir James Paget it tends to destroy life in an average period of about four years. Sometimes the disease runs its whole course in a few months; sometimes it exists for twenty years. As a general rule the younger the patient the more unfavourable is the prognosis.

Medullary cancer, as a primary affection, is less common than scirrhus, though as a secondary growth, it is often met with after extirpation of a hard cancer. It occurs at an earlier age than scirrhus, grows rapidly, and soon forms a large, smooth, elastic tumour with dilated veins coursing over it. As it increases the axillary glands become affected; it attaches itself to the subjacent muscles; the skin becomes purple and ulcerates, and the morbid growth protrudes in fungous masses. It does not infect the system so deeply as scirrhus, nor does it produce the same degree of prostration. The constitutional effect is not in proportion to the local manifestation of the disease. The male breast is sometimes, though very rarely, the seat of a malignant tumour.

The *treatment* of malignant tumours of the breast is unsatisfactory. Constitutional remedies are of no *curative* value. They are of much use in improving the state of the patient's health, and enabling her to withstand the violence of the disease; but beyond this they are powerless. Neither can we boast of having any local means of effecting a certain cure. Entire removal, which holds out the best hope, seldom does more than relieve the more urgent symptoms, and prolong life for a few months. And there are many cases to which even this remedy is inapplicable. For example, when the skin is brawny over a large extent, when the general health is seriously impaired, when there is reason to think that internal organs are secondarily affected, when the tumour is widely adherent, or very much ulcerated, when both breasts are diseased; or when the glands under or above the clavicle are enlarged—in all these cases an operation is forbidden. On the other hand, when the tumour is of moderate size, moveable, and growing slowly, when the axillary glands are unaffected, and the patient's health is not yet impaired, the results of an operation will probably be good. If a scirrhous cancer shows itself rather late in life, say after the age of fifty-five, and progresses but slowly, it may be a question whether an operation ought to be recommended. To know exactly when to interfere in a case of this kind is a difficult practical point.

Equable pressure has occasionally been found to be of great service in allaying pain, and sometimes even in arresting growth.

Under any circumstances, pending an operation, or if an operation is forbidden, the breast should be treated with anodyne lotions and ointments; and, if ulceration has taken place, poultices, either plain or medicated, should be applied.

If the patient declines a cutting operation, the growth may sometimes be removed by caustics—either spread on the surface, in the form of a paste, or introduced into or beneath the tumour in the shape of "caustic arrows."

EXCISION OF THE BREAST

is performed by making two curved incisions including an elliptical portion of skin, of which the nipple is the centre. The amount of skin removed must depend upon the extent to which it is involved in the disease. All that is affected should be taken away, but no more. The integument should be dissected back, so as to expose the whole anterior aspect of the tumour. The growth should be lifted from its cellular bed, and the dissection carried on under it, beginning from above and proceeding downwards. If there are any enlarged glands in the neighbourhood of the tumour, they should be removed at the same time. The bleeding points should be ligatured, or secured by torsion, and the edges of the incision must be carefully united by sutures. A large flat pad of folded lint should then be placed over the seat of operation, and retained by a bandage.

PARACENTESIS ABDOMINIS.

The belly has sometimes to be tapped for ascites, or for ovarian dropsy. In such cases the abdomen is much distended, and there is distinct fluctuation. The patient's breathing is embarrassed, and the general health suffers. Care must be taken not to mistake a gravid uterus, with an unusual amount of liquor amnii, for an ovarian cyst or for ascites.

When the surgeon is called upon to tap the abdomen, he should provide himself with a roller about eighteen inches broad, and long enough to go once and a half round the patient's body. Such a binder may most conveniently be made by folding an ordinary bed-sheet. When the operation is about to be performed, the patient should be brought to the edge of the bed, and directed to lie upon his back or side, as may be most convenient, and then the roller should be passed under him, so that its central portion may be directly beneath the abdomen. The surgeon then folds the ends of the binder across the front of the patient's body, and gives one to each of his assistants, who stand at the opposite sides of the bed, and are prepared to draw gently, but steadily, upon the bandage, so as to support the abdomen as the fluid escapes. An incision, an inch long, is then made through the integuments in the middle line of the body, and three or four inches below the umbilicus. Through this a trochar and canula is pushed into the cavity. If the patient feels faint, the flow of liquid may be stopped for a time, and a cordial administered. After the fluid has been evacuated, the pressure should be kept up, while the opening made by the trochar is closed with adhesive plaster and a pad of lint. Then the ends of the binder should be folded round the patient's body, and firmly pinned in that situation.

OVARIAN DISEASE.

The ovary is often affected by morbid growths. These are either malignant or fibrous, and are commonly associated with cystic formations (*cystic disease of the ovary, ovarian dropsy*). These cysts appear to originate in the Graafian vesicles. They may be single or multiple; the tumour may be unilocular or multilocular. The contents of the cysts vary extremely. They may be either solid or fluid. The fluid is usually thick, viscid, albuminous, and of a brownish or greenish colour.

Ovarian tumours sometimes remain stationary for a length of time, but much more commonly they go on increasing until they prove fatal by exhaustion, or by interfering with the action of the viscera.

Treatment.—Little or nothing can be done by medical means. If the case is otherwise suitable, the tumour may be simply tapped, or tapped and injected with iodine. If these means fail, and the symptoms are urgent, the question of *ovariotomy* must be entertained. The cases which are the most favourable for this operation are those in which there is but little solid matter, where there is a pedicle of some length, where there are no adhesions, and where the patient's general health has not yet begun to suffer. But, unfortunately, the character of the tumour and its connexions are points which it is often difficult, or impossible, to ascertain beforehand.

Ovariotomy.—An incision, two or three inches in length, is made through the *linea alba*, between the umbilicus and the pubes, and carried down to the tumour. The finger, or an elastic catheter, should then be introduced through the opening to explore the surface of the tumour, and to ascertain if there are many adhesions. If there are none, and the tumour consists of a single cyst, it may be tapped, and withdrawn through the aperture. If, on the other hand, there are adhesions, or if the growth is solid, the incision will have to be enlarged, the adhesions divided, and the tumour separated from its attachment. The pedicle may either be drawn forward, and fixed in the wound by a clamp; or else ligatured, and left in the abdominal cavity—the ligature being either cut off short, or allowed to protrude through the incision. The superficial wound is then closed with sutures, and a bandage applied round the abdomen.

PENETRATING WOUNDS OF THE ABDOMEN are always attended with danger, and require to be carefully watched. If any of the viscera are wounded, the shock will probably be great. The patient falls into a state of collapse, which is so far favourable that it facilitates the natural hæmostatic processes. The surgeon should not, therefore, be in a hurry to bring about reaction. If one of the large arteries is divided, or if the liver or spleen is wounded, there will be danger of fatal hæmorrhage. If there is extravasation of bile or of urine, peritonitis is inevitable. If the intestines are injured, there will probably be hæmatemesis, or melæna. If the kidneys are wounded, there will be blood in the urine—hæmaturia.

Treatment.—The most perfect rest and quietness should be enforced. Opium should be given freely. The diet should be strictly limited, and confined to food which is readily absorbed by the stomach. If inflammation threatens, calomel should be combined with the opium. (F. 70.) Blood should be drawn by the lancet or by leeches. Fomentations or water-dressing should be applied. Purgatives must not be given. If need be, and the circumstances of the case permit, an enema may be administered from time to time.

If the bowel protrudes, it should be gently replaced. If it is wounded, and the wound is a mere puncture, nothing need be done; the mucous lining will bulge and close the aperture. If it is slit up, the incision should be accurately brought together by the glover's suture, using a fine catgut or hempen thread. If it is so extensively wounded that there is no chance of union, it should be stitched to the margin of the superficial wound, so as to form an artificial anus. In cases of this kind the displacement is often not so great as we should have expected. The contents of the abdomen, by the even pressure they exert, do something to prevent extravasation. Moreover the peritoneum pours out lymph freely, and repairs the damage that has been done. But whenever the abdominal walls have been wounded, it is probable that a hernia will afterwards occur at the seat of injury, and the patient should be warned of this when he begins to move about.

Injuries of this nature are very apt to be followed by

PERITONITIS.

The symptoms of such an attack are these. The patient lies on his back, and relaxes his abdominal muscles by drawing up his knees. His breathing is chiefly thoracic. He scarcely ventures to move his diaphragm or abdominal muscles. His features are pinched; his expression is anxious; the pulse is small, hard, and quick; the tongue is dry, and the mouth is parched. There is frequent vomiting; the belly is exquisitely tender, and the bowels are constipated.

Treatment.—Perfect rest and quietness must be secured. Opium should be given in full doses, combined, if the surgeon thinks fit, with calomel. Effervescing salines should be prescribed. (F. 31, 58.) Small pieces of ice should be given frequently, to allay sickness and to moisten the mouth. Fomentations should be applied, and in some cases, if the patient is young and plethoric, a dozen leeches may be placed on the abdomen; while enemata are administered occasionally, as the occasion requires.

ARTIFICIAL ANUS

signifies an unnatural opening into the intestinal canal for the discharge of fæces. It may be made by the surgeon, or it may be the result of a wound, of an abscess, of ulceration, or of the sloughing of a strangulated hernia. When the communication with the bowel is but slight, and the contents merely ooze out, it is called a "fæcal fistula."

When the artificial anus is in the upper part of the small intestine, life can only be prolonged for a time. The patient must gradually die of starvation by escape of the chyle. But when the aperture is in the large intestine, it is compatible with a fair share of health, though it must always be a source of great discomfort.

When the surgeon is required to make an artificial anus for obstruction, or imperforate anus, he commonly cuts down upon the lower part of the descending colon, in the left lumbar region, entering behind the peritoneum (Amussat's operation). The gut is exposed, slit open, and stitched to the edges of the integument.

Treatment.—In all affections of this kind the patient's strength must be supported, the wound kept very clean, and the margins smeared with simple ointment to prevent excoriation. A fæcal fistula will probably close of itself, and heal over. If the case is one of artificial anus, and the bowel is pervious, an attempt may be made to unite the edges of the wound. It generally happens, however, that after the artificial anus has existed for a short time, the lower and unused part of the gut becomes contracted. Moreover, the wall of the bowel opposite the aperture protrudes, and forms a septum, dividing the part which is traversed by the fæces from the part that is not. This is one great obstacle to re-establishing the natural channel. Dupuytren proposed to get rid of the septum by compressing it between the blades of a forceps until it sloughed away; after which an attempt might be made to close the superficial wound.

HERNIA

signifies a protrusion of the contents of one of the natural cavities. Thus we speak of hernia of the brain, of the lung, and of the intestines. But when the term stands alone it is taken to mean the protrusion of a portion of the intestines through the walls of the abdominal cavity (rupture); such protrusions being by far the most common herniæ that are met with in adult life.

Herniæ are variously classified. If we look to the seat of the protrusion, we speak of *inguinal, femoral, umbilical, diaphragmatic*, and *obturator hernia.* If we consider their pathology, we describe them as *reducible, irreducible, incarcerated,* or *strangulated.* According to their anatomical relations they are divided into *congenital* and *infantile*; and according to their contents into *enterocele, epiplocele,* &c.

Hernia cerebri has been explained in speaking of wounds of the brain, and diaphragmatic and obturator herniæ are of such rare occurrence that I need not do more than mention them.

Predisposing causes of abdominal hernia.—Whatever tends to weaken the abdominal walls—*e.g.*, congenital deficiency of muscular or tendinous structures, penetrating wounds, or abscess in the parietes—predisposes to hernia.

Exciting causes.—Among the exciting causes of hernia may be mentioned whatever makes pressure upon the weakened part of the parietes, as excessive crying in infants, coughing, straining at stool or in micturition, violent exertion, riding, leaping, &c.

The coverings of a hernia differ with its precise situation. In almost all cases it has a *sac*, formed by the parietal layer of peritoneum, which it carries before it. The cases in which there is no sac are rare. They are the herniæ which follow penetrating wounds, and the protrusions of those viscera which are only partially covered by peritoneum. With these exceptions, every hernia is invested by a sac of peritoneum. That part of the sac which is at the point of protrusion is called the *neck*, while the rest is termed the *body*. The neck is often the seat of constriction in cases of strangulated hernia.

Diagnosis of hernia.—The tumour has come suddenly, perhaps while the patient was making an unusual exertion. It has increased from within outwards. It is not persistent, but retires when the patient lies down, and appears again when he gets up. It is situated at one of the natural apertures in the abdominal walls. It is regular in outline, circumscribed, pyriform, free from pain or tenderness, and does not implicate the skin. If it is composed of omentum, it is doughy to the touch; but if it contains bowel and fluid, it may be tense, elastic, and gurgling. An impulse can be communicated to it by coughing; it can be reduced by making the patient lie down, and using a little manipulation, technically called *the taxis*. Such are the characteristics of an ordinary reducible hernia.

A rupture is said to be *reducible* when it can be returned without difficulty. When it is permanently protruded, and cannot be returned, but gives rise to no urgent symptoms, it is termed *irreducible*. This state of things is apt to arise when the sac becomes adherent to the tissues which cover it on the one hand, and to the viscera it contains on the other; or it may be due to the deposit of fat in a descended omentum. Irreducible herniæ are always attended with inconvenience, and they are apt to cause irregularity of the bowels, with derangement of the digestive organs. Moreover, they are very liable to become strangulated from slight causes.

When an irreducible hernia becomes temporarily obstructed by accumulation of fæces or of gas, but without any urgent symptoms, it is said to be *incarcerated*. When the passage of fæces is interrupted, such interruption being attended by acute inflammatory symptoms, the hernia is said to be *strangulated*. Incarceration is often a step towards strangulation. If acute symptoms supervene upon an incarcerated hernia it becomes strangulated.

With these general remarks I shall proceed to speak in detail of some of the commoner varieties of hernia.

And first of inguinal hernia, which presents itself under two principal forms, the *oblique* and the *direct*.

Oblique inguinal hernia is the name applied to that variety in which the protrusion originates at the internal abdominal ring, on the outer side of the deep epigastric vessels, travels obliquely along the whole length of the inguinal canal, and appears at the external abdominal ring. The bowel follows the course of the spermatic cord. This is the most common rupture that is met with in the male.

When the intestine is lodged in the inguinal canal, and has not yet made its way through the external ring, it is called a *bubonocele*. After it has passed the external ring, it gradually protrudes into the scrotum or labium.

Bubonocele may have to be distinguished from undescended testicle. In the latter case the testis is absent from the scrotum, and there is sickening pain on pressing upon the tumour.

The coverings of an oblique inguinal hernia are, from without inwards: (1) skin, (2) superficial fascia, (3) inter-columnar fascia, (4) cremasteric fascia, (5) fascia propria (infundibuliform) derived from the fascia transversalis, (6) sac.

The hernial protrusion lies in front of the spermatic cord, and the neck of the sac is just outside the deep epigastric vessels.

Congenital hernia.—When, from imperfect fœtal development, the prolongation of the peritoneum, which goes to form the tunica vaginalis, is not closed, the intestine makes its way along the pervious canal into the tunica vaginalis, and comes into immediate contact with the testis. A congenital hernia has no proper sac; its sac is the parietal layer of the tunica vaginalis.

Infantile hernia occurs in cases where the pouch of peritoneum, which goes to form the tunica vaginalis, is separated from the general cavity of the peritoneum, but still remains open to a higher point than usual. When this happens, and the intestines protrude in the ordinary way (as they are very apt to do under such circumstances), we have the condition known as infantile hernia. The rupture insinuates itself behind the elongated tunica vaginalis. It has, therefore, as it were, a double sac—a proper sac derived from the peritoneum, and a secondary sac formed by the layers of the tunica vaginalis, which are compressed in front of the proper sac. In cases of this sort, the tunica vaginalis is very prone to become inflamed, and distended with fluid (hydrocele).

Direct inguinal hernia originates on the inner side of the deep epigastric vessels, immediately behind the external abdominal ring. It either bursts through, or pushes before it, the conjoined tendon. It then presents itself at the external ring, and makes its way gradually down to the scrotum or labium. Its coverings differ from those of the oblique inguinal hernia in that it lacks the cremasteric fascia; but sometimes it has a tunic formed by the conjoined tendon.

Diagnosis of inguinal hernia.—It is often impossible to distinguish between a direct and an oblique inguinal hernia. In recent cases, the diagnosis may sometimes be made, by attending to the situation and direction of the tumour; or by restoring the intestine, and then insinuating the finger, and examining the anatomical relations of the passage.

Hernia and hydrocele may be distinguished by attending to the following characteristics. Hernia begins from above, is opaque, does not fluctuate, does not obscure the testicle, receives an impulse on coughing, and can generally be reduced by making the patient assume the horizontal position. Hydrocele begins from below, is translucent, receives no impulse on coughing, fluctuates, obscures the testicle, and does not disappear when the patient lies down. The two conditions, however, not unfrequently coexist.

Varicocele may be mistaken for rupture. The best test is to make the patient lie down, when the swelling, of whichever nature, will disappear; the surgeon then presses his finger on the external ring, and orders the patient to stand up; if it is a rupture, it will not descend, whereas if it is a varicocele, it will quickly show itself.

Femoral hernia passes through the crural ring, beneath Poupart's ligament. When the patient stands erect, the neck of the sac has in front of it Poupart's ligament, behind it the pectineus muscle and the pubes; on its inner side Gimbernat's ligament; and, on its outer side, the femoral vessels in their sheath. The protrusion takes place into the crural canal, that is to say, into the innermost compartment of the crural sheath. When the bowel reaches the saphenous opening in the fascia lata, it comes forward beneath the skin; then, instead of descending down the thigh, it makes its way upwards, so that the tumour is doubled upon itself, the neck of the sac being beneath Poupart's ligament, while its fundus is immediately over it. It is important to notice this, because in all attempts at reduction the force should be applied in the opposite directions, that is to say, downwards, inwards, and upwards.

The coverings of a femoral hernia are, from without inwards: (1) skin, (2) superficial fascia, (3) cribriform fascia, (4) crural sheath, (5) septum crurale, (6) sac.

This variety of hernia is most common in women on account of their greater breadth between the hips.

Femoral hernia may generally be distinguished from inguinal, by observing the relative position of Poupart's ligament.

From a varicose condition of the superficial veins of the thigh it may be diagnosed, by making the patient lie down; and then, when the swelling has subsided, placing the thumb firmly on the crural ring. In such circumstances, a hernia cannot descend, whereas a varicose tumour soon reappears.

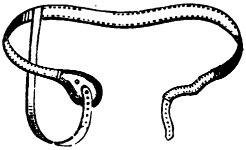
From psoas abscess it may be distinguished, by the history of the case, and the absence of fluctuation.

From enlarged lymphatic glands there may be more difficulty in making the diagnosis. The history of the case, and the presence, or absence, of a cause for the inflammatory enlargement, are the points that must guide us.

The *treatment* of these various forms of hernia may conveniently be considered together. When a rupture descends, the surgeon should reduce it with as little delay as possible, endeavouring at the same time to discriminate accurately to what variety it belongs. This is not always easy, but it is desirable, if possible, because the truss-pad is sometimes made to vary in shape according to the nature of the case.

For all ordinary herniæ the common truss, or, as it is sometimes called, Hart's truss, is perhaps better than any of the numerous patent instruments which have been invented. It consists of a pistol-shaped pad which covers the hernial opening, and a steel spring which passes round the patient's body, and is affixed by means of a short strap to a stud on the back of the pad. Sometimes an under-strap is added which commences at the back of the truss, passes under the perineum, and is attached in front to the stud on the pad. (Fig. 98.) In applying the truss the surgeon should first place his patient in the recumbent posture, and ascertain that the rupture is entirely reduced. He should then stretch the spring round the wearer's hips, adjust the pad upon the hernial opening, and secure the strap to the stud. When the patient stands up, a little further adjustment may perhaps be wanted, and the surgeon may have to shift the strap from one button-hole to another, before he brings the instrument into a position which controls the rupture, and is at the same time comfortable to the wearer.

Fig. 98.



The common truss (Hart's).

Coles's truss consists of a steel spring, which goes half way round the body, from the seat of rupture to the spine. At each end of the spring there is a pad—a large flat one which bears against the spine, and a convex one which covers the hernial opening. The hernial pad is hard and unyielding, being made of tin covered with flannel or leather; but a certain amount of elasticity is given to it by a spiral spring which is placed within it. The principal objection to this truss is its convex pad, which has a tendency in some cases to enlarge the hernial opening; otherwise it is a light and convenient instrument.

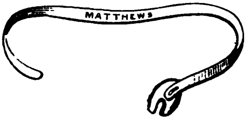
Salmon and Ody's truss has a steel spring, which goes three-quarters of the way round the body—from the groin where the rupture is situated, across the pubes, and round the hips to the spine. The hernial pad, which is slightly convex, is attached to the spring by means of a ball-and-socket joint, and this adapts itself to the movements of the patient's body.

The peculiarity of Egg's truss consists in its strong steel spring, which is said to be made out of old sword blades. The spring goes completely round the waist, and is bent to a large curve, so as nearly to follow the outline of the patient's body. A very slight degree of pressure from a strong spring, such as this, serves to restrain the rupture, and to keep the instrument in its place. Indeed, Egg's truss may be said to act rather by supporting the abdominal walls than by making pressure upon them. Any kind of pad may be fitted to one of these trusses.

The Mocmain lever truss has two chief characteristics:—(1) The pad is stuffed with a peculiar material known as "Mocmain"—a vegetable substance, which has a silky texture and a remarkable degree of elasticity; and (2) the spring-force is applied by means of a lever, which is placed at the back of the pad, so that the steel girdle is altogether dispensed with. A leathern belt encircles the waist, and supports the pad; while a strap passes under the perineum from behind forwards, and is affixed to the lever. It is upon the tension of this under-strap that the pressure upon the hernial opening depends; and hence arises the chief objection to these trusses, for when the thigh is flexed, as in going upstairs, the under-strap is relaxed, the pressure upon the lever diminished, and then the rupture may make its escape behind the pad.

Besides these there are various other patent trusses, which may be found useful in particular cases, but those we have mentioned are the best known. We must not, however, leave this subject without drawing attention to the plated truss made by Messrs. Matthews, of Portugal Street. This instrument has an elegant appearance, besides the great recommendation of resisting the effects of the perspiration, and requiring no covering of leather or calico. The spring itself is as delicate as is compatible with the amount of strength which is required to fix the truss in its place without any other fastening. (Fig. 99.) A truss of this description, fitted with one of Mr. Wood's pads, is perhaps the best appliance of the kind that modern science and skill have devised.

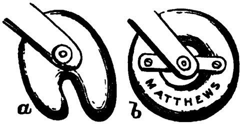
Fig. 99.



Matthews' plated truss.

Mr. Wood has introduced truss-pads for cases of inguinal hernia which are intended to bear upon the margins of the hernial opening, and not to protrude into the aperture itself, as the ordinary convex ones are apt to do. Mr. Wood's pad for an oblique inguinal hernia is shaped like a horseshoe (Fig. 100, *a*), whereof the convex portion presses upon the internal opening of the canal; while the outer limb lies along Poupart's ligament, and the inner one along the internal pillar of the ring. By this means firm pressure may be made upon the sides of the hernial opening, while a space is left through which the spermatic cord and vessels can pass.

Fig. 100.



Wood's truss-pads.

For direct inguinal hernia Mr. Wood uses a circular pad, with a hole in the centre (Fig. 100, *b*)—the circle following the margins of the opening, and making such firm backward pressure, and so stretching the skin, that the rupture cannot escape. For femoral hernia Mr. Wood recommends a pad which is oval in outline, and which has a flat surface that is placed against the front opening of the crural canal, while the upper edge is rounded to support Poupart's ligament, and the lower bevelled off to fit the saphenous opening.

Mr. Wood's pads are generally made in some hard, smooth material, such as boxwood or vulcanite; sometimes, however, they are fitted with small air or water cushions; but in any case they are shaped so as to adapt themselves to the anatomical requirements of each variety of rupture.

We may here add a few general remarks applicable alike to all trusses. After a truss has been adjusted by the instrument maker, the surgeon should examine it himself, and see that it fits the patient properly, and that it keeps its place under all ordinary movements. Moreover, he should take care that the spring is strong enough to control the rupture. With this view he should direct the patient to stand up, with his legs apart, and to cough several times in rapid succession. If the bowel does not protrude under this stress, the surgeon may feel satisfied that the spring will bear all the pressure that is likely to be put upon it. The truss generally requires to be covered throughout with leather or calico, to prevent it from being affected with the perspiration. It should be worn constantly during the day—being put on before the patient rises from bed in the morning, and not laid aside until he lies down at night. If, as in the case of children, the instrument is used, not merely as a precautionary measure, but also with the view of producing a radical cure, it will be all the better if the patient will consent to wear it by night as well as by day. It is sometimes well for a patient, though ruptured only on one side, to wear a double truss; for there is often a weakness of the corresponding region on the opposite side of the body;

and when one groin is compressed, a greater strain is thrown upon the other, so that it is apt to give way.

If the skin becomes chafed it should be bathed with a little eau-de-cologne or brandy, or with a spirituous lotion (F. 18), and then carefully dried with a soft towel, and dusted over with violet powder or French chalk.

If a patient presents himself to the surgeon with a reducible hernia, and a truss cannot at once be provided, the ordinary spica bandage may be applied over a pad by way of a temporary expedient (see Fig. 116); and care should be taken to explain to the patient that his life is in jeopardy as long as he is going about without a proper truss.

In children we may hope to obtain a cure by the habitual use of a truss; but in adults such a result cannot be expected. Here the truss is a mere palliative, and if we desire to effect a radical cure, it must be by the performance of an operation. Operations for the radical cure of hernia proceed upon two principles. They either aim at invaginating the skin, superficial fascia and sac, so as to plug the opening through which the hernia passes (Wützer's operation); or else, after invaginating the sac and fascia, the sides of the aperture are brought together by means of subcutaneous stitches, and held in that position until a sufficient amount of adhesive inflammation has taken place (Wood's). But I am inclined to agree with Mr. Bryant that "where a hernia can be kept up by a truss, and the patient is likely to remain in a civilized country where trusses can be obtained, any operation for the radical cure is an unjustifiable one" ("Surgery," p. 358).

If the hernia is found to be irreducible, the patient should be instructed to wear a bag-truss with a hollow pad which accurately fits the protrusion, so as to prevent its increase. If the hernia becomes incarcerated, the *treatment* must consist in rest in the horizontal position, fomentations or iced applications, clysters, and the taxis.

If the rupture is strangulated, the symptoms are urgent; and the treatment must be prompt and decided.

Symptoms of strangulated hernia.—The patient is restless and uneasy; his features are pinched; and his expression anxious. He complains of twisting pain at the umbilicus; the bowels are constipated; there is nausea and vomiting. After a time the matter, which is thrown up becomes feculent, *stercoraceous.* The pulse is hard, small, and frequent; gradually becoming weak and flickering. The tumour, which at first is neither painful nor tender, becomes by degrees tense and exquisitely sensitive. These symptoms gradually become aggravated, and the patient grows more and more exhausted. If the local pain and tenderness suddenly cease, if the tumour becomes doughy, emphysematous, and purple, if the patient expresses himself as much relieved—these signs, taken together, indicate that gangrene has commenced, and they are generally followed by speedy death.

But it sometimes happens that, though the hernia and its coverings slough, death does not follow. The mortified parts are thrown off, an opening into the bowel is established, there is a free discharge of fæces, the urgent symptoms subside, and the patient gradually rallies from his state of prostration. The communication with the bowel remains, and must be subsequently treated as an artificial anus.

Treatment.—In the treatment of strangulated hernia time is of great importance. The patient should at once be placed in the horizontal position, with his knees drawn up, so as to relax the abdominal muscles. The taxis should then be used, that is to say, the surgeon should endeavour to restore the protruded viscera by manipulation. With this view, he grasps the body of the tumour with one hand, and while steadily compressing it he pushes it towards the aperture, through which it emerged. At the same time, with the other hand, he gently pinches the neck of the tumour, so as to enable it to enter more easily. The surgeon should ascertain whether he is dealing with an inguinal or a femoral rupture, for the direction in which pressure should be made differs somewhat in each case. The taxis should be employed carefully; much harm is often done by its prolonged and injudicious use.

If manipulation fails, the patient may be brought thoroughly under the influence of chloroform; or he may be placed in a warm bath; or a full dose of opium may be given, and the taxis tried again. Or a bladder of ice may be applied to the tumour for a couple of hours; or the patient may be inverted—that is to say, the lower part of his body raised on pillows, so as to empty the sac of some of its fluid contents—and the taxis may be used as before. Purgatives should not be given, but the lower bowel may with advantage be cleared out by a simple enema. Other remedies, such as venesection, antimony, tobacco, &c., used to be in vogue; but if those which we have enumerated above are fully and fairly tried without producing any effect, the sooner an operation is performed the better. Delay adds much to the danger.

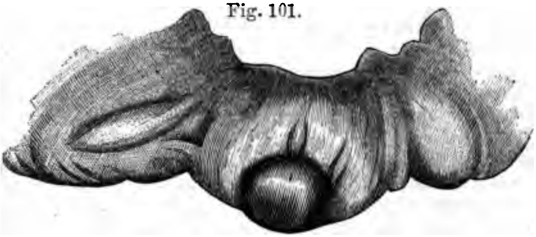
Operation for strangulated hernia.—A fold of skin over the neck of the tumour should be raised, transfixed, and the knife made to cut its way out. The coverings are then divided by a careful dissection, layer by layer, until the sac is reached. This may be known by its glistening, silvery appearance, and by the *branching* vessels on its surface.

The question now arises, Should the sac be opened or not? To this I reply that, as a general rule, the sac ought always to be opened. Unless we open the sac we cannot tell what is the condition of the intestine, nor can we be sure that there is not a second constriction within the sac. Such an opening need not be extensive. In many cases it is enough if it will admit the forefinger, so as to enable us to explore the cavity.

The point of constriction is generally found to be either the thickened neck of the sac or some tendinous or membranous band outside it.

Fig. 101 represents a portion of the ilium, of which a knuckle had been strangulated in the crural ring. The patient was a middle-aged woman. The constriction was remarkably tight, and had existed for sixty hours before it was released. The patient died on the fourth day after the operation. The knuckle was gangrenous, and there was considerable peritonitis.

Fig. 101.



Strangulated hernia.

In operating for a strangulated oblique inguinal hernia, the constriction will sometimes be found at the external, but more frequently at the internal abdominal ring. It should be divided on the finger, or on a director, with the hernia-knife. The incision should be made *directly upwards*—that is to say, parallel to, and not across, the course of the epigastric vessels.

In the case of a strangulated femoral hernia, the constriction will be found either at the inner part of the falciform process of the fascia lata, or else at Gimbernat's ligament. In either case the edge of the knife should be directed *upwards and inwards*. A mere nick often suffices to relieve the constriction.

It should be borne in mind that the obturator artery sometimes arises from the epigastric. When it does so, it lies close to the falciform border of Gimbernat's ligament, and would thus embrace the neck of a femoral hernia. The operator should therefore proceed with caution.

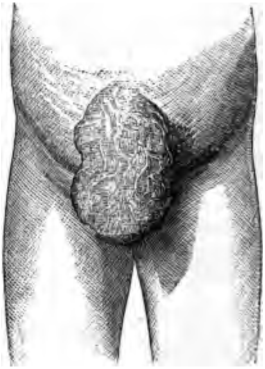
If the gut is merely congested, of a ruby or claret colour, but smooth on its surface, and firm in its texture, it should be returned without hesitation; but if it is rough, friable, patchy, of a black, grey, or greenish colour, it should be drawn gently out, the gangrenous portion cut off, the edges of the wound stitched to the integuments, and the case treated as one of artificial anus.

If the omentum is mortified, the gangrenous portion should be cut off, and the bleeding vessels secured by torsion, or by a fine ligature. It may then be left protruding through the aperture, in the hope that it may become adherent, and close the opening.

After the operation the edges of the wound should be brought together and secured by sutures. A little water-dressing should be applied, covered by a pad and a bandage. The diet should be bland, but nutritious. If need be, a simple enema may be given, but purgatives ought to be avoided; the bowel should have a few days' rest in order to enable it to recover itself.

If the symptoms of strangulation exist, while the precise nature of the tumour is doubtful, the general rule is to operate.

Fig. 102.



Irreducible umbilical hernia.

Umbilical hernia often occurs in infants. Sometimes it is congenital, but much more frequently it manifests itself a few days after birth; the crying or straining of the child causing a portion of the intestines to protrude at the umbilical aperture. Occasionally this form of rupture is seen in adults, and then it is probable that there has been some ulceration round the navel in infancy, or some other cause of weakness. Fig. 102 represents a large irreducible umbilical hernia in an old woman, aged seventy-one. It had existed about three years. She attributed it to over-exertion in nursing a relative, a tall, heavy man.

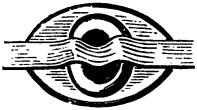
Treatment.—If the hernia cannot be reduced, a truss, with a hollow pad adapted to the tumour, should be habitually worn. If it becomes strangulated, an operation must be undertaken of the same nature, and with the same object, as that which we have described in speaking of inguinal hernia; but adapted, of course, to the anatomy of the part.

Usually, however, there is no difficulty in returning an umbilical hernia. By a little manipulation the protruded intestine can be restored to its place, and then the patient must wear a truss to prevent it from protruding again. The simplest sort of truss consists of an elastic band passing round the patient's body, and pressing upon a pad, which is placed over the aperture by which the hernia escapes. Very convenient appliances of this description may be obtained from the surgical instrument makers. In hospital practice it often suffices to apply a pad over the umbilical opening, and to fix it by means of a strip of adhesive plaster. A suitable pad for these cases may be made by taking a flat cork, or a small piece of wood, and folding it in lint. With these simple materials a truss may be made which answers all practical purposes; and, as the subjects of this complaint are generally infants, the adhesive plaster has the advantage of not being easily displaced by the movements of the little patient.

If these simple measures are adopted, Nature seldom fails to do the rest. Hence it is that in rural districts many superstitious practices receive the credit of effecting a cure. Thus, for instance, Archbishop Whately says—"There is a curious remedy in high repute for rupture in an infant: an opening is made, by means of wedges, through the middle of the stem of a young tree, and the infant is passed a certain number of times to and fro through the opening. The tree is then carefully bandaged, and if its wound heals the child will recover. There were in the garden of the rectory of Halesworth, in Suffolk, several trees which had undergone this operation. . . . . Sometimes instead of cleaving a tree, they passed the child under a bramble that grows into the ground at both ends."—("Miscellaneous Remains.")

In cases of umbilical hernia the truss should be worn constantly—being renewed from time to time as circumstances may require; and care should be taken that it is always properly adjusted, and that it presses with a slight, but even, force upon the aperture over which it is placed, so that the bowel cannot escape behind it. Mr. Wood is of opinion that the pressure ought not to be exerted upon the centre of the aperture, but upon its margins; for if the pressure is central it tends to enlarge the aperture, whereas if it is marginal it has the opposite effect. With this

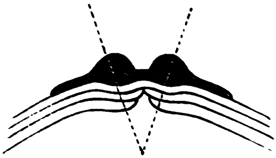
Fig. 103.



Pad for umbilical hernia.

view he has devised a pad for umbilical hernia (Fig. 103) made of india-rubber or gutta-percha, and which consists of a thin, flat base lying in contact with the skin, and an oval ridge which corresponds to the margins of the hernial aperture, and upon which the pressure is exerted by means of an elastic belt. The accompanying diagram, copied from Mr. Wood's treatise on Rupture, is intended to represent a sectional view of the abdominal walls in a case of umbilical hernia; and to show the direction in which the pressure is exerted by such a contrivance as we have described.

Fig. 104.

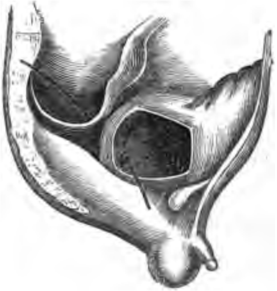


IMPERFORATE ANUS.

Sometimes there is a congenital deficiency of the anus: there is no free passage between the bowels and the anus. This malformation is more common in male than in female children.

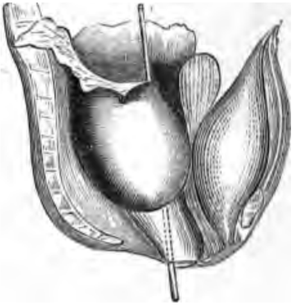
In these cases the rectum may terminate in the bladder; or it may take its proper course, but fail to reach the anus by an inch or more; or the rectum may be complete, but the anus closed by a membrane. These are the commonest varieties of the malformation. Fig. 105 represents the first variety. It was drawn from a case of Mr. Spencer Watson's. Fig. 106, showing the second variety, occurred in my own practice.

Fig. 105.



Imperforate anus (1).

Fig. 106.



Imperforate anus (2).

Treatment.—If the anus is merely skinned over, and the membrane distended by an accumulation of meconium, an incision should be made at once.

If, however, the aperture is firmly closed, a sharp-pointed curved bistoury should be introduced very carefully upwards and backwards, to the extent of an inch. The surgeon should then explore the wound with his finger, in the hope of reaching the gut. If he succeeds, he should draw it down, and stitch it to the edges of the superficial wound. If he fails, the only remedy is to perform Amussat's operation, and make an artificial anus in the left lumbar region.

FISSURE OF THE ANUS.

The mucous membrane at the verge of the anus is apt to become cracked or fissured. When this happens, there is exquisite pain, the sphincter is spasmodically contracted, and the nates are pressed together, so that it is extremely difficult to get a clear view of the disease. The pain is so much aggravated by defecation that the patient dreads going to stool. The general health suffers, and the invalid becomes pale, thin, and anxious-looking.

The fissure is generally associated with a disordered state of the stomach. Sometimes it appears to depend upon syphilis. It is often found lying at the base of an external pile, or tag of hypertrophied skin.

Treatment.—The bowels should be regulated, so that the motions shall always be soft and semi-fluid. The fissure should be touched with bluestone, or with a pencil of lunar caustic. If this fails, an incision should be made through the fissure, so as to divide the mucous membrane and a few of the fibres of the sphincter. This clean-cut wound soon heals from the bottom, in the ordinary way.

ULCER OF THE RECTUM

often results from an aggravated fissure. Sometimes it is situated upon the verge of the anus; sometimes it is within the sphincter.

It gives rise to much the same symptoms as fissure of the anus, and the treatment must be conducted on the same general principles. When it is situated at the verge of the anus, it should be divided, and the incision carried through the sphincter. When it is internal to the muscle, it may sometimes be cured by the local use of the nitrate of silver, while the bowels are carefully regulated, and the pain and irritation are allayed by small anodyne injections or suppositories.

HÆMORRHOIDS

(*piles*) is the name given to certain tumours, which are apt to form at, or near, the anus. They consist essentially of a dilated, varicose, and hypertrophied condition of the veins at the lower part of the rectum.

Whatever favours the accumulation of blood in the lower bowel predisposes to piles; for example, constipation, disease of the liver, pregnancy, &c. The upper classes, from their luxurious habits and the sedentary nature of their employments, are more apt to have hæmorrhoids than the lower. Whatever irritates or inflames the rectum, excites to "a fit of the piles;" for example, diarrhœa, cold and wet, &c.

Hæmorrhoids are divided into those which are *external* to the sphincter, and those which are *internal*.

External piles form small tumours, at the verge of the anus, of a purple or bluish colour, covered partly by thickened mucous membrane, partly by hypertrophied skin. As a rule, they do not bleed. When they are irritated and congested, as they frequently are towards evening, they give rise to intolerable itching and smarting. When they become acutely inflamed, they form hard, tense, purple tumours, which are exquisitely painful.

Treatment.—If external piles are cut off with scissors, and the sores allowed to heal, a radical cure is effected. They may, however, be palliated and kept in check by carefully regulating the diet and bowels. The evacuations should always be soft and pasty. To this end, a mild laxative—a little of the confection of senna, for example—should be taken every night. At the same time soothing or astringent ointments—*e.g.*, cacao butter or the ung. gallæ co.—should be applied locally. Sponging the part with cold water every morning, and also after the bowels have been moved, is of the utmost benefit.

When an external pile is acutely inflamed, fomentations should be used. Or a free incision should be made through it; this will give immediate relief, and ultimately effect a cure.

Internal piles are situated within the sphincter ani. Sometimes they form pendulous tumours; sometimes they are attached by a broad base. They may habitually protrude from the anus, or they may descend only when the bowels are moved. They bleed freely, and often give rise to general anæmia. They are very apt to become inflamed, and when this happens, the symptoms run high. There are great pain and irritation, not only in the rectum, but in the genito-urinary organs as well.

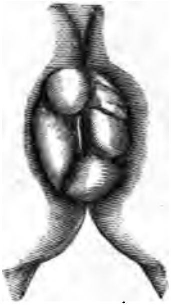
The general *treatment* is the same as for external piles. We must regulate the diet, and study the state of the bowels and liver. The bleeding may be checked by astringents, either given internally—*e.g.*, gallic acid or the muriated tincture of iron, —or as injections—*e.g.*, alum, tannin, &c. (F. 14.) Here, too, the cold bath is of great service. It should be borne in mind that, in the case of plethoric persons, it is not always safe to stop the discharge of blood. If inflammation occurs, fomentations and saline purgatives will give the greatest relief.

In order to effect a radical cure of internal piles, they must be removed with the ligature. The patient should sit over a pan of warm water, and then strain, so as to bring the tumours fully into view. They may then be strangulated, either with a single loop of twine, or by passing a double ligature through the base of the pile, and tying each half separately. In some cases the écraseur may be used; in others they may be grasped with a suitable clamp, cut off, and the edges of the wound touched with nitric acid, or with the actual cautery.

PROLAPSUS RECTI.

The mucous lining of the rectum sometimes protrudes beyond the anus, forming *prolapsus recti.* (Fig. 107.) Whatever irritates, relaxes, and stretches the mucous membrane may lead to this complaint—for example, internal piles, thread-worms, stone in the bladder, constipation, with habitual straining at stool.

Fig. 107.



Prolapsus recti.

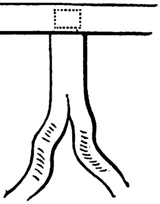
A tumour of varying size presents itself at the anus. At first it is bright red, like healthy mucous membrane; but if it comes down often, it gradually becomes thickened and callous, and more like skin.

The *treatment* consists in removing the cause, as in the case of ascarides, stone in the bladder, &c., in regulating the bowels, so that the fæces shall always be soft and semi-fluid, and in giving tone and vigour to the system. If possible, the patient should pass his motions in the recumbent position. When the bowel descends, it should be carefully and gently replaced. The parts should be frequently sponged with cold water, or with an astringent lotion. Injections of an astringent character should be introduced into the rectum.

If an operation becomes necessary, the ligature should be used; as in the case of internal piles—our object being to remove some of the superfluous folds of mucous membrane, and to contract the anal aperture. Some surgeons speak highly of the effect of applying nitric acid.

Sometimes a pessary, or a pad and bandage, may be worn with advantage.

Fig. 108.



T-bandage.

T-*Bandage for the Perineum.*—The simplest appliance of this kind is made by passing a single turn of bandage round the patient's waist, tying it behind, and then carrying the roller under the perineum, and fastening it to the waistband in front. Or the surgeon may prefer a compound bandage made by sewing together two pieces of cotton roller, or other material, at a right angle to one another. (Fig. 108.) First of all, a piece of broad bandage is taken of sufficient length to pass round the waist and fasten in front. To the centre of this is stitched at right angles another strip of bandage, long enough to be brought under the perineum and attached in front to the waistband. It is important that this should be stitched across the whole width of the waistband, so as to give it a firm attachment, for it is upon this point that the traction is made. Sometimes the perineal band is left entire; sometimes it is torn down the centre, so as to make two tails, and these are brought up one on each side of the scrotum and attached to the waistband in front. The exact way in which the bandage is adjusted depends upon the purpose for which it is applied, and the surgeon must use his own judgment in the matter. It is very useful for supporting the perineum in cases of prolapsus of the rectum or of the uterus, for retaining pessaries, for fixing dressings about the anus, &c. As a general rule, in applying dressings to the anus, the bandage ought to be brought from behind forwards, in the way we have described.

FISTULA IN ANO

is the name given to sinuses or fistulous tracks, which are apt to form in the neighbourhood of the rectum, between it and the skin around the anus. The fistula may communicate with a free surface at both ends, or only at one. When it is open at both ends, it is said to be *complete.* If it communicates with the bowel alone, it is called a *blind internal fistula;* if with the skin alone, it is termed a *blind external fistula.*

The disease seems sometimes to begin in ulceration of the mucous membrane of the bowel. Perhaps, in consequence of the lodgment of foreign bodies, or minute masses of hardened fæces, an abscess forms, which burrows and makes its way in various directions by the side of the rectum. At other times, it appears to originate in spontaneous inflammation of the cellular tissue in the ischio-rectal fossa, running on to suppuration, and extending either outwards towards the skin, or inwards towards the gut.

Fistula in ano is often associated with phthisis, and depends, no doubt, upon the tendency there is in that disease to ulceration of the intestines.

The *symptoms* of fistula are those of acute local inflammation, running on to suppuration. At first, there is pain, heat, tension, with disorder of the general health; then there is commonly the discharge of purulent matter, mixed with fæces and flatus. The symptoms vary of course somewhat, according to the precise nature of the case.

A fistula shows no natural tendency to heal; partly, because irritating matters from the bowels are constantly filtering through it, but chiefly, because its sides are in frequent motion by the action of the levator and sphincter ani muscles.

In order to ascertain the extent of a fistula, one finger should be introduced into the rectum, while a probe is passed upwards through the fistulous track. If the case is one of blind internal fistula, there will generally be found an abscess, pointing somewhere near the anus. This should be opened, and then the case becomes one of complete fistula.

The only *treatment* worthy of notice is by operation, and this is so simple and so efficient that it is almost universally practised. In a case of complete fistula, the surgeon introduces his left forefinger into the rectum; while, with his right hand, he passes a blunt-pointed, curved bistoury along the fistulous track through the opening in the bowel, and presses it firmly against the point of his finger. He then withdraws his finger and the knife together, so as to cut through everything between the sinus and the anus. Thus the fistula is laid freely open, and the sphincter divided. Another and more convenient plan is to pass a director in at the fistulous opening, and to bring it out at the anus. This may easily be done by a little manipulation. The intervening tissues must then be divided by running a knife along the groove. If there are several sinuses a director should be introduced into each before the knife is applied to any. The wound should be filled with a strip of oiled lint, so as to insure its healing from the bottom. Blind fistulæ should be converted into complete ones, and then treated as above.

In cases where fistula is associated with phthisis, it becomes a nice question whether an operation should be performed or not.

STRICTURE OF THE RECTUM

may be either spasmodic or permanent.

Spasmodic stricture of the rectum is rare. It depends, either upon derangement of the general health, or on the presence of an ulcer or fissure.

Permanent stricture of the rectum is more commonly met with, and may be either simple, syphilitic, or malignant.

Simple stricture is usually the result of chronic inflammation of the rectum, with thickening of the lining membrane, and deposit of lymph in the submucous areolar tissue. The stricture is generally situated within reach of the finger, two or three inches from the anus.

Symptoms.—There is difficulty in passing the motions. The fæces are sometimes flattened into ribbons; in other cases, they are formed into small, hard, round masses. The bowel above the seat of obstruction becomes distended, and is very apt to ulcerate. The genito-urinary organs become sympathetically affected, and the general health suffers.

The *treatment* consists in passing bougies, until a full-sized instrument can be introduced without difficulty. Even then, the patient should be warned that the disease will assuredly return unless a bougie is passed occasionally.

Syphilitic stricture must be treated by the same mechanical means, and by the prescription of anti-syphilitic remedies.

Malignant stricture may be considered along with cancer of the rectum.

CANCER OF THE RECTUM

is generally of the scirrhous, but sometimes of the medullary, kind. It is often associated with piles, or with simple stricture. It is usually situated at the lower part of the rectum, so that it can be felt with the finger.

Symptoms.—In addition to the ordinary symptoms of stricture of the bowel, there is impairment of the general health, pain darting through the back and thighs, and the discharge of offensive, bloody, purulent matter. As the disease advances, the symptoms become more severe, and the obstruction of the bowels is complete. Death generally takes place from exhaustion.

Treatment.—The bowels should be relieved by enemata, or by small doses of castor oil. When the necessity arises, a bougie should be passed, to keep the passage open. Pain should be allayed by opium or other sedatives, given either by the mouth or in the form of a suppository. As a last resource, to relieve the patient's distress, colotomy may be performed.

RETENTION OF URINE

signifies an inability to discharge the urine, and must not be confounded with *suppression*, wherein no urine is secreted.

Retention may arise from various causes. They may, however, all be classed under two heads: (1) a want of power in the bladder to expel its contents, or (2) an obstruction to the passage of the urine.

When the retention arises from a want of power in the bladder to expel its contents, it is generally due to lesion of the spinal cord attended by paralysis. In such a case there are no urgent symptoms. The urine collects in the bladder, overflows, and dribbles away by the urethra; it soon becomes offensive, ammoniacal, and loaded with ropy mucus.

The *treatment* of these cases consists in drawing off the water two or three times a day, and washing out the bladder by means of a double-current catheter.

Symptoms of retention from obstruction.—Urgent desire to pass water with an inability to do so, straining, pain, with general anxiety and distress. The bladder may be felt rising above the pubes, forming an elastic, fluctuating tumour, which is dull on percussion. If the retention is not relieved, the ureters gradually become dilated, the kidneys affected with diffuse pyelitis, and there is suppression of urine, followed by coma and death. But it more frequently happens that the urethra gives way behind the point of obstruction, and the urine escapes into the surrounding tissues (*extravasation of urine*).

When retention depends upon obstruction to the passage of the urine, it is generally associated with stricture of the urethra, or enlargement of the prostate. Each of these subjects will be considered separately.

STRICTURE OF THE URETHRA

may be either *spasmodic* and temporary, or *organic* and permanent.

Spasmodic stricture is caused by contraction of the muscles which surround the membranous portion of the urethra, or of the unstriped muscular fibre, which forms part of the walls of the canal.

The *predisposing causes* are an organic stricture, gleet, piles, or other source of irritation about the urethra or rectum; and, in women, the hysterical temperament. The *exciting* causes are usually exposure to cold and wet, or excessive and unwonted indulgence in drink.

Treatment.—Fomentations, a warm bath, a full dose of opium, or an opiate suppository—these means will often enable the patient to empty his bladder. If they fail to remove the spasm, chloroform should be given, and the surgeon should introduce a large catheter (No. 8 or 9). If the distension is already great, this method should be adopted at once. When the present attack has been overcome, the patient's general health should be regulated; and he should be warned of those conditions which are apt to excite spasm.

Organic stricture is the result of inflammation in or near the urethral canal. Such inflammation is very often gonorrhœal, but it may also be excited by external injury, or by the use of too strong an injection. In any of these cases, a stricture may be formed by the effusion of lymph into the lining membrane of the urethra, or into the submucous areolar tissue. A stricture may also result from the cicatrization of an ulcer, simple or specific. In this way, chancres near the orifice often give rise to troublesome strictures.

The character of the stricture may vary: sometimes it is annular, as if a thread had been tied round the urethra; sometimes it is long; sometimes it is situated on one side only of the canal; sometimes it is rough and cartilaginous; sometimes a fold like a valve is thrown across the canal.

The most common seat of stricture is at the junction of the membranous with the spongy portion of the urethra, or a little in front of this point.

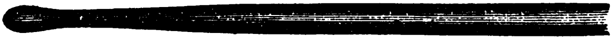
When a stricture has once formed, it tends to become worse; the contraction goes on increasing; the urethra behind the point of constriction becomes dilated. The muscular coat of the bladder gets thickened and hypertrophied, and the lining membrane is disordered. The ureters become distended and tortuous; the kidneys congested, and liable to acute inflammation. Thus the stricture gradually extends its pernicious influence in a backward direction, while the constant irritation makes the patient nervous and depressed. At first, the constitution may suffer little or nothing; but, ultimately, it is apt to become seriously, and even fatally, affected.

Symptoms.—The patient gradually finds that he has more frequent calls to make water. The effort to do so is attended with pain and difficulty. The stream is diminished, forked, or scattered. In very bad cases the urine is passed drop by drop, and with much straining. The act of micturition may be followed by rigors or prostration. There is often a continuous gleety discharge from the urethra, or intercurrent attacks of orchitis, or other indications of local irritation. The patient is liable to occasional fits of retention, which are associated with more or less inflammation at the seat of stricture.

Treatment.—If there is reason to suspect a stricture, a catheter of large size (No. 8 or 9) should be cautiously passed along the urethra. If a stricture is present, an obstruction will be felt, and it will be necessary to try smaller instruments, until one is found which can be introduced into the bladder without using undue force.

With regard to catheters, the most manageable, and therefore the most generally useful, are the silver instruments; and if they are handled, as they always should be, with a light and elastic touch, and with constant regard to the anatomy of the urethra, the risk of injury is very slight. There are, however, some cases—for example, those of spasmodic or congestive stricture—in which a gum-elastic instrument is preferable. The soft French *bulbous bougie* (Fig. 109) is sometimes very useful. No instrument glides through an irritable passage with less discomfort to the patient. While in other cases, more particularly if the stricture is long, tight, and twisted, the filiform, or the catgut bougie is of great service.

Fig. 109.



Bulbous bougie.

When a catheter has to be introduced, the patient may either stand with his back against a wall, his legs separated, and his feet slightly advanced; or he may lie on his back on a couch. If he stands up, the operator should be seated opposite him; but if he lies down, the surgeon should stand on his left side. We will suppose the patient to be in the recumbent position. The instrument which is to be used should be well warmed and oiled. The surgeon then grasps it lightly, but firmly, between the fingers and thumb of the right hand, while, at the same time, he raises the penis with his left. The point of the catheter is then inserted into the orifice of the urethra, and the instrument is passed slowly but steadily along, until it reaches the bulb—the shaft, meanwhile, being kept low down on the left groin, parallel with *Poupart's* ligament. The handle should next be swept round, *till it is in the* middle line of the body, pointing to the navel. It is then bent forwards and downwards. By this movement the point of the catheter is directed upwards and onwards, enters the bladder, and the urine escapes. The discharge of urine through the instrument is the only certain evidence that it has reached the bladder.

If the patient is in the erect posture, the surgeon holds the catheter vertically, with the convexity turned towards himself, and the handle directed downwards. The point of the instrument is introduced into the urethra, and carried along as far as the bulb. The handle is then swept round through half a circle, until it lies along the mesial line of the abdomen, pointing to the umbilicus. It is then brought downwards and forwards, between the patient's legs.

In withdrawing the catheter, the surgeon takes hold of the handle between his middle and forefingers, so that he may, if need be, cover the outlet with his thumb. He then reverses the steps by which he introduced the instrument, so as to remove it with as little pain to the patient as possible.

If difficulty arises in passing an instrument, there are various little manœuvres which may be practised. The penis may be stretched upon the catheter, so as to obliterate any folds there may be in the mucous membrane; or the fingers of the left hand may be applied to the perineum, behind the scrotum, so as to help the instrument in its onward and upward course; or the left forefinger, well oiled, may be passed into the rectum, so as to direct the point. The instrument should be carried along the upper wall of the urethra, rather than the lower. If the surgeon fails with a metal catheter, he may perhaps be more successful with a gum-elastic. If he fails in the recumbent position, he may meet with less difficulty if he makes his patient stand up, or if he puts him under the influence of an anæsthetic. The catheter should always be handled lightly, the least possible amount of force being used; our aim being to insinuate the instrument without irritating the urethra, causing pain, or drawing blood. This is one of the occasions on which the young surgeon should bear in mind the oft-repeated maxim of Hippocrates—"Do good if you can, but at least do no harm." The most serious, and even fatal, consequences may follow an injudicious or unskilful use of instruments. It requires much practice, as well as great tact and patience, to pass the catheter skilfully; and cases not unfrequently arise which baffle the most accomplished surgeons.

If the surgeon fails to pass an instrument, and the case is not urgent, he may content himself with regulating the bowels, and ordering fomentations and opiate suppositories, in order to allay inflammation and spasm, and reduce the stricture as much as possible. Then, on a subsequent occasion, he may be more successful. Mr. Nunn holds, and I think with good reason, that many of the dense cartilaginous strictures are of syphilitic origin, and are benefited by a course of anti-syphilitic remedies.

If the surgeon fails to pass an instrument, and the case *is* urgent, other methods of treatment must be adopted.

a. A full-sized catheter may be forced through into the bladder. But this must be regarded as a very unsafe and very unscientific proceeding, and is only mentioned that it may be condemned.

b. Or the bladder may be tapped from the rectum. To do this, the surgeon introduces his forefinger into the rectum, and feels the prostate. He then carries it a little further, and touches the distended bladder. On his finger he passes the curved trochar and canula made for the purpose, and by a sharp thrust he forces them into the bladder. The trochar is withdrawn, and the canula left in the wound. When the prostate is much enlarged, this operation cannot be employed.

c. Or the urethra may be opened by a deep incision in the perineum. A full-sized catheter is passed down to the stricture. The surgeon then introduces his finger into the rectum, and feels the point of the instrument. He next runs a knife, with its back turned towards the rectum, deeply into the middle line of the perineum, till he opens the urethra behind the stricture, a little beyond the point of the catheter. As he withdraws the knife, he cuts forwards and upwards, so as to enlarge the incision. In doing this he may, if he thinks proper, divide the stricture by cutting on to the point of the catheter. The instrument may then be carried forwards into the bladder, and fastened in that position by tapes. In this way the retention is relieved, and the stricture cured at the same time. This method of treatment is particularly applicable to cases in which there has been extravasation of urine, or where there are fistulous openings in the perineum; but the operation is often attended with great difficulty.

d. Or the bladder may be punctured above the pubes, either with a trochar and canula, or with the pneumatic aspirator.

But, supposing that the stricture is not impermeable, that a small instrument can be passed, though with difficulty, what ought to be the subsequent treatment?

A great variety of instruments have been invented for the purpose of rapidly restoring the urethra to its natural calibre. Some of these stretch the stricture, others rupture it forcibly, while others *incise it* from its inner aspect. It may here suffice to mention *Sir H. Thompson's*, Mr. Holt's, and M. Maisonneuve's instru*ments*, as representatives of these several methods.

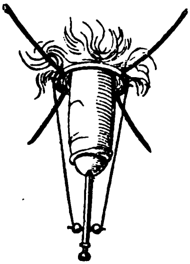
But it may be confidently asserted that no plan of treatment is so safe, or so generally applicable, as the gradual dilatation by catheters. One or two instruments may be introduced every alternate day; and if the largest size which is passed is allowed to remain in the stricture for half an hour or so, it promotes absorption of the thickened tissues, and facilitates the introduction of a larger instrument on the next occasion. In this way No. 10 may be passed without difficulty in the course of two or three weeks. When this happy result has been obtained, the patient should be warned that his stricture is almost certain to return, unless he has a full-sized catheter passed at least once a month.

In the case of cartilaginous "resilient" strictures, Mr. Syme recommended dividing the constriction from its outer aspect (*perineal section*). A small staff, grooved on its under surface, is passed through the stricture. A deep incision is then made in the middle line of the perineum, the back of the knife being turned towards the rectum. The point of the blade is introduced into the groove on the further side of the stricture, which is divided as the knife is withdrawn. A full-sized catheter is then passed into the bladder, and fastened by tapes.

In many operations upon the pelvic organs it is necessary to fasten a catheter into the bladder. I may therefore take this opportunity of explaining the various ways in which this may be done.

To retain a Catheter in the Male Bladder.—The surgeon having ascertained that the catheter is in the required position, attaches two pieces of narrow tape to the rings of the instrument, brings them down one on each side of the penis, and secures them by a strip of adhesive plaster passing round the organ. Or the same object may be effected in the following manner:—The surgeon first applies a single turn of bandage round the patient's waist. Next he takes an ivory ring of suitable size, and to this he attaches four pieces of narrow tape, each about a yard long. He then passes the ring down to the root of the penis, and brings two of the tapes up in front, one along each groin, and fastens them to the waistband. The other two tapes he conducts backwards, under the perineum, across the fold of the buttock, and ties them to the waistband. In this way the ring is secured, and affords a fixed point to which the catheter may be attached. In both instances the knots should be placed at the patient's sides, for in this situation they will cause him no discomfort, and the surgeon will be able to reach them without difficulty. A similar piece of tape, about half a yard long, is then attached by its centre round the neck of the catheter, or fastened to its rings, and *the ends* are brought down, one on each side, and tied to the ivory ring. (Fig. 110.) By this means the catheter may be removed by merely untying the tapes which fasten it to the ring. If a silver catheter is used care should be taken not to force the instrument so far into the bladder as to press against the posterior wall. The surgeon should see that the orifice of the catheter is furnished with a wooden peg, which the patient may remove at pleasure when he wishes to evacuate the urine. This will be found more convenient than an ordinary stylet.

Fig. 110.



To retain a Catheter in the Female Bladder.—A T-bandage, the vertical portion of which has been split into two tails, is applied to the patient in the usual way; and the tails are brought up, one on each side of the vulva, care being taken to put a little cotton-wool between them and the labia externa, to prevent excoriation. The catheter ought then to be introduced into the bladder, and a piece of narrow tape, about half a yard long, tied by its centre round the neck of the instrument. The ends of the tape are brought down, one on each side, and tied to the tails of the T-bandage at the point where they pass the orifice of the urethra. Or the T-bandage may be dispensed with, a gum-elastic instrument used, and the free end fastened to the patient's thigh by a broad strip of adhesive plaster.

After a catheter has been tied into the bladder of either a male or a female patient, it may be necessary to make some arrangement whereby the bedclothes may be raised, and kept from pressing upon the end of the instrument. This may be done by means of a cradle, such as that represented in Fig. 62; or, if such a thing is not at hand, an apparatus may be made, which answers all practical purposes, by taking a bandbox, from which the bottom has first been removed, cutting it up the side, and then stretching it across the patient's hips.

EXTRAVASATION OF URINE

may proceed either from the bladder or from the urethra.

The bladder may give way from ulceration, or it may be wounded in surgical operations, or it may be lacerated by direct violence.

When the urethra bursts, it is generally as a consequence of retention following stricture, or from external injury.

Symptoms of extravasation from retention.—The patient is conscious that something has given way, perhaps while he was straining. The rupture is invariably in front of the posterior layer of the triangular ligament. The immediate feeling is one of relief. Soon, however, the scrotum and lower part of the belly become infiltrated with urine. The skin is stretched, feels doughy, crepitates, and, if relief is not afforded, rapidly runs into sloughs. At the same time, there is great prostration, with inflammatory symptoms of an asthenic kind—a brown tongue and a tendency to muttering delirium.

If the extravasation arises from injury, the rupture may be situated in the bladder, or in any part of the urethra. If it is behind the posterior layer of the triangular ligament, the outward signs may be less distinct than when it is in front of that point, but the case will be more certainly fatal.

The *treatment* must be prompt and vigorous. Free incisions should be made through the skin, wherever the tissues are infiltrated, so as to give vent to the extravasated urine. Poultices should be applied to promote the separation of the sloughs, and afterwards water-dressing or stimulating lotions. If possible, a catheter should be passed at once. If this cannot be done, the urethra should be opened from the perineum, the stricture being dealt with at the same time, or subsequently, as the surgeon may think fit. The diet should be liberal, including beef tea, eggs, and wine or brandy. (F. 86.) The medical treatment should be stimulating and supporting, as there is a great tendency to death by exhaustion.

URINARY ABSCESS

is a frequent result of stricture. It may arise from irritation, or it may be caused by the escape of urine into the submucous cellular tissue, in consequence of ulceration. In either case, an abscess forms in the immediate neighbourhood of the urethra, sometimes communicating with it from the first. Such abscesses may occur at any part of the urethral canal, but they are most common near the bulb (*perineal abscess*). The symptoms are those of acute abscess. When they are situated behind the line of the scrotum, they should be opened by a free and early incision. If a stricture exists, it should be dilated as soon as possible.

URINARY FISTULA

often forms, more especially in the perineum (*fistula in perineo*), as a consequence of stricture or urinary abscess. A fistulous track exists between the urethra and the skin, and by this the urine dribbles away whenever the patient makes water.

Treatment.—The first thing is to dilate the urethra so as to establish the natural channel for the urine. The next point is to close the fistula. This is often a work of no small difficulty. Sometimes, when the fistula is narrow and recent, the use of a stimulating lotion, or the application of caustic, or of a red-hot wire, may lead to its contraction. More frequently, however, the sinuses will have to be laid open, and an attempt made to heal them from the bottom. If the fistula is in front of the scrotum, a urethro-plastic operation will probably be required.

INFLAMMATION OF THE PROSTATE.

The prostate is liable to be acutely inflamed. The most common causes of this affection are gonorrhœa, blows on the perineum, irritation of the genital organs or about the rectum, and exposure to cold and wet.

The *symptoms* are pain and heat in the situation of the prostate, tenderness on deep pressure in the perineum, frequent calls to make water, with some difficulty in doing so. Evacuation of the bowels is attended with pain.

Treatment.—The patient should be confined to bed, and the part well fomented. Leeches may be applied to the perineum, and opiate enemata introduced into the rectum.

Abscess of the prostate sometimes occurs as a consequence of acute inflammation. When this happens, an early incision should be made through the perineum, to prevent the abscess from bursting either into the rectum or urethra.

ENLARGEMENT OF THE PROSTATE

is by no means uncommon in advanced life.

The muscular fibre, which forms the larger portion of the gland, becomes simply hypertrophied. Sometimes it enlarges uniformly; sometimes one side, one lateral lobe, increases more than the other. Sometimes the enlargement is chiefly in the central and posterior part, between the ejaculatory ducts, forming what has been called the "middle lobe." In any case, the course and dimensions of the urethra are altered. The curve which it forms as it enters the bladder, is increased and lengthened. If the enlargement is confined to one lateral lobe, the urethra will be twisted; if it is in the posterior median portion, then the passage will be flattened, compressed, and closed as it were by a valve.

Symptoms.—The water is passed slowly and with straining. There are frequent calls to micturate, but it is impossible for the patient to empty his bladder altogether, on account of the mechanical impediment. A residuum of urine is left, which decomposes, and excites disease in the coats of the bladder, giving rise to great pain and distress. Occasionally, there may be acute attacks of inflammation, or complete retention. On examination *per rectum* the surgeon feels that there is enlargement; and if he attempts to pass an ordinary catheter, he meets with difficulty and obstruction.

The *treatment* is merely palliative. A suitable catheter, with a large curve and a long shaft, should be passed from time to time, in order to draw off the residual urine. The patient may, perhaps, be taught to do this for himself. He should support himself on his hands and knees while the water is escaping. If the coats of the bladder have become affected, they must be treated in the way that will be explained in speaking of the diseases of that organ. When complete retention occurs, it may be necessary to force a catheter through the substance of the prostate, or to tap the bladder above the pubes; but the former operation, though sanctioned by high authority, is not regarded with favour by modern surgeons. The bowels should be regulated, and excesses of all kinds should be avoided, so that, as far as possible, inflammatory attacks may be prevented.

ACUTE INFLAMMATION OF THE BLADDER

(*acute cystitis*) may arise spontaneously, or from neglected gonorrhœa, or from the unskilful use of instruments.

Symptoms.—There is pain, which extends to the sacrum, the perineum and along the urethra, and tenderness on deep pressure over the pubes. The water is passed frequently, with pain and difficulty; and when the bladder is emptied, the symptoms are aggravated rather than relieved. At first, the urine contains only mucus, but afterwards it is mixed with pus and blood. There is great constitutional disturbance with mental depression and irritability.

Treatment.—The patient must be confined to bed, and restricted to a low diet. Leeches should be applied to the lower part of the abdomen. Fomentations and warm hip-baths should be used, a free purge should be given, followed by gentle laxatives. Opium should be administered, both by the mouth and in suppositories. Sir H. Thompson recommends injecting the bladder with borax and glycerine in warm water (F. 6.)

CHRONIC INFLAMMATION OF THE BLADDER

(*chronic cystitis, catarrhus vesicæ*) generally depends upon stricture, enlarged prostate, stone in the bladder, or disease of the rectum or kidneys. It may, however, arise spontaneously.

Symptoms.—There is frequent and painful micturition. The urine contains a large quantity of viscid mucus, mixed with pus and streaked with whitish lines of phosphate of lime. Subsequently, as the disease progresses, the secretion becomes brownish, ammoniacal, and very offensive. The mucous coat may become ulcerated, and then there will be blood in the urine, with great aggravation of pain. The muscular coat becomes hypertrophied or sacculated, and perhaps encrusted with phosphate of lime. Ultimately the disease extends to the kidneys, and then death cannot be long delayed.

Treatment.—The cause should, if possible, be removed—stricture dilated, stone taken away. Disease of the kidneys or prostate should be palliated.

The bladder should be daily washed out with warm water, by means of a syringe and a double-current catheter. Opium and henbane should be given by the mouth, or morphia by the rectum. The medical treatment should include the preparations of buchu, pareira, uva ursi, and the muriated tincture of iron; while the vegetable acids or the alkalies are given, according to the state of the urine. The diet should be generous but unirritating, and should be accompanied by an abundance of simple diluent drinks (F. 88. 89).

CANCER OF THE BLADDER.

The bladder is often secondarily affected in cases of cancer of the rectum, but it may also be the primary seat of disease. When this happens, the growth will be found to be either medullary or epithelial (villous).

The *symptoms* are frequent and difficult micturition; and pain, extending throughout the pelvis and along the penis, especially when the bladder is empty. The urine is thick, fœtid, and mixed with blood. If the sediment is examined with the microscope, it may perhaps facilitate the diagnosis. If the bladder is sounded, no stone can be detected, but a soft mass can sometimes be felt projecting from the wall.

The *treatment* is merely palliative. All that we can do is to support the strength by a generous diet and tonics; to check the tendency to hæmorrhage by styptics, such as the gallic acid or the muriated tincture of iron; and to allay pain by opium.

URINARY DEPOSITS—CALCULUS.

The deposits which are met with in the urine are chiefly the following—

1. Minute crystals of free uric (lithic) acid, or the urates of

ammonia and soda. This constitutes the brick-dust or lateritious deposit so often seen in gouty or rheumatic affections.

2. Oxalate of lime.

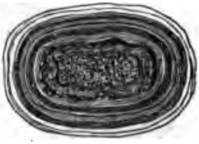
3. Phosphates of lime, magnesia, and ammonia.

When any of these deposits is habitually present, the patient is said to be of the phosphatic, the oxalic, or the lithic acid diathesis. The deposit may take place in the bladder, as well as out of it. First, minute particles of *gravel* are formed, and these gradually increase, until they result in a *stone* (*calculus*).

These three diatheses correspond to the three commonest varieties of calculi that are met with in the bladder—the lithic acid, the oxalate of lime, and the phosphatic calculus.

1. The lithic acid stone is usually of moderate size, smooth, flattened, of a light brown or drab colour, and arranged in concentric laminæ. (Fig. 111.) It is met with chiefly in children, and in adults of a gouty habit. It indicates derangement of the digestive organs and mal-assimilation, often from the use of an over-stimulating diet. The tendency to the formation of lithic acid calculus is shown by the habitual deposit of white, pink, or red lithates in the urine, and by occasional "fits of the gravel." These attacks are of a febrile nature, attended with much constitutional disturbance, and depend upon irritation of the urinary organs, from the presence of crystals of lithic acid.

Fig. 111.



Lithic acid calculus.

The general *treatment* must consist in early hours, sufficient exercise, and a strictly regulated diet. The bowels should be kept freely open by saline aperients; and in this class there is nothing better than the natural waters of Friedrichshall, Pullna, or Hunyadi-Janos. At the same time alkaline medicines should be prescribed (F. 46, 54, 57), or a tumblerful of Vichy or Carlsbad water should be taken once or twice a day.

2. The oxalate of lime, or mulberry calculus, is generally associated with exhaustion of the nervous system. The urine deposits a slight sediment of octohedral or dumb-bell crystals of oxalate of lime. The stone itself is of a dark purple or brown colour, of moderate size, more or less round, with a rough tuberculated surface, and very hard.

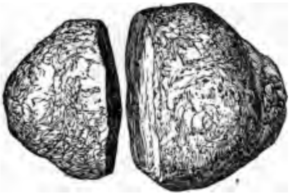
The oxalic diathesis should be *treated* by a light but nourishing diet, avoiding sweets and fermented liquors; tonics should be prescribed, especially the mineral acids, iron and quinine (F. 26, 27, 28, 41, 55), with plenty of fresh air and sunlight.

3. The phosphatic calculus is met with in persons of broken health, or of exhausted nervous energy. It is apt to form when there is disease of the bladder, and the urine is imperfectly voided. It is sometimes composed of triple phosphate, sometimes of phosphate of lime, sometimes of a mixture of the two. The mixed variety is the commonest; it is called the *fusible* calculus, because it melts readily on the application of heat. Phosphatic stones sometimes attain great size—the bladder is filled with an irregular chalky mass, which is easily broken down. Sometimes they are only semi-solid, and present an appearance like mortar.

The phosphatic diathesis should be *treated* by the mineral acids (F. 25, 26, 27, 28), a generous but unirritating diet, and a regulated manner of life.

A stone may either originate in the bladder or in the kidney, and from thence make its way into the bladder. In the case of the lithic and oxalic acid calculi the nucleus is almost invariably formed in the kidney.

Fig. 112.



Calculi with facets.

Sometimes there is but one stone in the bladder, at other times there are many. When several calculi are present at once, they rub against one another, so that their adjacent sides become flattened, and present facets. (Fig. 112.)

Calculi generally lie loose in the bladder; but it occasionally happens, that they become encysted in one of the sacculi which are apt to be formed when the muscular coat becomes hypertrophied.

Calculus is much more frequent in men than in women. Again, more than half of all the cases occur during childhood; while in some countries and districts the disease is far more prevalent than in others. Along the east coast of England, in Norfolk particularly, it is more common than in other parts of this country.

Symptoms.—There is pain in the bladder and perineum extending to the glans penis. It is aggravated by quick movements, as in riding or leaping, especially when the bladder is empty. There are frequent calls to make water. The urine may be mixed with mucus or pus, and it occasionally contains blood. Sometimes the stone rolls forward during micturition, so as to cover the neck of the bladder, and then the flow of urine is suddenly stopped. "When such persons (as have stone in the bladder) make water," says Hippocrates, "the stone forced down by the urine falls into the neck of the bladder, and stops the urine, and occasions intense pain; so that calculous children rub their privy parts, and tear at them, as supposing that the obstruction is situated there" (Syd. Soc. Translation, i. 201). Sometimes there is tenesmus and prolapsus recti, more especially in children; and sometimes there is priapism.

When the surgeon suspects the presence of a stone, he proceeds to *sound* the patient. In the case of children, it may sometimes be necessary to give chloroform before this can be done; and in every case it is well to raise the patient's hips on a pillow, so that the stone may gravitate towards the fundus vesicæ. The sound—a steel instrument with a narrow shaft, and a short, curved and slightly bulbous extremity—is introduced into the bladder. The surgeon holds the handle of the instrument lightly but firmly, and by a series of short, quick movements of the wrist he gently taps the wall of the bladder with the end of the sound. The examination should be systematic. First one side of the bladder should be searched, and then the other, so as to leave no part unexplored.

If the stone should happen to be lodged behind an enlarged prostate, or above the pubes, or if it should be encysted, there may be difficulty in detecting it.

When the point of the sound touches the stone, the hand is conscious of contact with a hard body. By tapping on the stone a clear note may be produced, which is distinctly audible, and which is very characteristic. By a skilful use of the sound the position and size of the stone may be estimated. A stone of moderate dimensions may be accurately measured by means of a lithotrite—much in the same way that the shoemaker measures the foot with his rule.

If a stone is allowed to remain in the bladder, it is apt to cause enlargement of the prostate, and serious disease of the coats. The muscular tissue becomes hypertrophied, and the mucous membrane thickened, congested, and perhaps ulcerated.

Treatment.—Hitherto all attempts to dissolve calculi by chemical agents, without injuring the coats of the bladder, have been unsuccessful. It is therefore necessary either to cut into the bladder, and remove the stone entire (*lithotomy*); or else to crush the stone in the bladder, and allow the fragments to be discharged with the urine (*lithotrity*).

LITHOTOMY.

There are various ways of cutting into the bladder. That which will be here described is commonly called *the lateral* *operation* (Cheselden's). We shall suppose that the patient is an adult, and that the left side of the perineum is to be cut.

In order to prepare the patient for the operation, he should be kept quiet for a few days, his health regulated, and irritability of the bladder allayed. The bowels should be opened before the operation by an aperient, or the rectum cleared by an enema.

The patient should be directed to hold his urine for a few hours before the operation; or a little tepid water (℥iv) should be injected into the bladder. He should be placed on a table, or hard bed, of convenient height. The thighs should be separated widely, and strongly flexed on the pelvis, while the legs are bent on the thighs. The lower extremities are to be held in this position by assistants, or tied with a lithotomy bandage. Such a bandage used to be applied as a matter of course, but since the introduction of chloroform it has generally been dispensed with. There are, however, many cases in which the surgeon and his assistants would be greatly aided by this appliance. It can easily be adjusted after the patient is under the influence of the anæsthetic, and then his movements are much more easily controlled than they are without it. It may be applied in the following way:—The patient being placed in the usual position for lithotomy, the surgeon takes a flannel "leg-bandage," or a piece of worsted webbing about three yards long, makes a "clove-hitch" in the middle of it, and puts it over one of the patient's wrists. He next places the patient's hand on the outside of the corresponding foot, and proceeds to apply the two ends of the flannel roller round the hand and foot, in such a way as to bind them securely together. The roller should be kept as flat as possible, and the ends should be tied in a bow on the outer side, so that they may be readily unfastened. The same steps are then repeated on the opposite side, and the bandage is complete. In cases of this kind, Mr. Prichard, of Bristol, uses a very convenient bracelet and anklet, which are buckled round the wrist and ankle respectively, and then hooked together when the proper time has arrived for placing the patient in position.

When the operation is about to be performed the patient should be so placed that the buttocks should project slightly over the edge of the bed, and the perineum be freely exposed. The surgeon begins by introducing a sound, to make sure of the presence of the stone. This is then withdrawn, and a full-sized curved or rectangular staff, grooved on the left side, is passed, and entrusted to an assistant, who holds it well up against the arch of the pubes, in such a position as the surgeon directs, and at the same time raises the scrotum. The surgeon next takes his seat opposite the patient. With his left hand he stretches the skin, while with his right he cuts the left side of the perineum. The external incision should begin about an inch and a half above the anus, and in the middle line of the body. It should be carried obliquely downwards and outwards, to the extent of about three inches, towards a point midway between the tuber ischii and the anus. By this incision the skin, superficial fascia, and subcutaneous fat are divided. A second and deeper incision is next made along the middle portion of the former one, by which the transversalis perinei muscle is divided, and the space lying between the accelerator urinæ and the erector penis muscles is opened. The forefinger of the left hand is then introduced into the wound, until the groove in the staff can be felt, thinly covered by the membranous urethra. The point of the knife is then pushed into the groove, and carried along far enough to notch the prostate. Into this slit in the urethra the point of the left forefinger is insinuated. By combining slight force with a rotatory movement it is carried along the side of the staff into the bladder. The staff is then withdrawn, the surgeon still retaining his finger in the bladder. A lithotomy forceps is next passed along the side of the finger into the bladder, and the finger is withdrawn. The stone is then seized, and removed. Sometimes a scoop is found a more convenient instrument for withdrawing the stone. When this is used, the calculus is grasped between the scoop and the point of the finger. If it is necessary to employ gentle force in order to extract the stone, it should be applied very gradually, and combined with a rotatory movement, so as to stretch the tissues slowly and evenly.

If there is free arterial bleeding, it may be necessary to apply one or two ligatures to the sides of the wound. If there is continued oozing, the wound may be plugged with lint wrapped round a tube or an elastic catheter. At first the urine escapes by the wound; but by the end of a week or ten days it begins to pass by the urethra. If all goes well the wound is generally healed in about three weeks.

Lateral lithotomy in children is a very successful operation. In performing it, the surgeon should bear in mind that the bladder, before the age of puberty, lies high up towards the abdomen. Moreover, as the urethra is small, the prostate comparatively undeveloped, and the tissues yielding, care must be taken not to push the bladder before the finger.

The success of lithotomy depends in a great measure upon the state of the bladder and kidneys. If these organs are free from disease, the result is much more likely to be favourable. Diffuse inflammation of the cellular tissue about the neck of the bladder—often arising from infiltration of urine—is a frequent cause of death. Occasionally patients die after the operation from hæmorrhage, or cystitis, or other complications; but these cases are comparatively rare.

Of late years *the median operation* has been revived by Mr. Allarton. It is most suitable to the case of small stones which cannot be crushed, or for foreign bodies in the bladder. It is performed thus:—A staff, with a central groove on its convexity, is introduced into the bladder, and confided to an assistant. The surgeon then passes his left forefinger into the rectum, and feels the prostate. He next pushes the knife, with its back turned towards the rectum, deeply into the middle line of the perineum, about half an inch above the anus, and hits the groove in the staff at the further end of the membranous portion of the urethra. Here he makes a small incision, cutting from behind forwards, and as he withdraws the knife, he enlarges the external wound upwards. He then introduces the point of his finger, or of a dilator, into the incision in the urethra, and stretches the prostate, until he can reach the bladder with a small forceps.

The bilateral and the supra-pubic operations are so seldom performed, that we need not do more than allude to them.

LITHOTRITY

is the name applied to the more modern operation of crushing. Suitable instruments are introduced into the bladder, the stone is seized, and is broken into small fragments. These are either removed at once, or allowed to make their way out with the urine.

When it can be practised, lithotrity is a safer, as well as a less formidable, operation than lithotomy; but there are many cases in which it is inapplicable. For example, in male children the urethra is too small to admit the passage of the necessary instruments. Or, again, where there is stricture, or enlarged prostate, or an irritable bladder, or when the stone is very hard, or very large, or where many stones are present, the case is not suitable for lithotrity. Probably, also, when there is well-marked kidney disease the risk of lithotrity is, on the whole, greater than that of lithotomy.

The *lithotrite*, or crushing instrument, is shaped somewhat like a sound. It has a handle, and a long straight shaft with a short curved extremity. It consists of two blades, which are accurately fitted together. The outer blade is fixed, and continuous with the handle. The inner blade travels in a longitudinal groove cut [illegible] the outer one. The force is variously applied, either by a [illegible]rew, or by a rack and pinion in connexion with the handle. By withdrawing the inner blade, the extremity of the instrument opens, so as to embrace the stone. The power is then applied, the blade is pushed home to its original position, and the stone crushed.

The patient should be directed to hold his water for a few hours before the operation, or his bladder should be emptied by the surgeon, and six ounces of tepid water injected. The hips should be raised, so that the stone may gravitate towards the fundus of the bladder. The lithotrite is then introduced, and with a light hand and gentle touch the surgeon feels for the stone. When he has found it, he withdraws the inner blade sufficiently to include the calculus within the grasp of the instrument, lifts it from the surface of the bladder, and then applies the force. If he thinks fit, he repeats the same process at once upon the larger fragments. But, under any circumstances, the "sitting" should not be protracted. It is better to await the result of the first operation, and perform a second, a third, or a fourth, if necessary, at intervals of a week. Nothing is more dangerous than the prolonged use of instruments in the bladder.

Some surgeons extract the fragments at the time of the operation with a scoop constructed on the same principle as a lithotrite. By this means they make sure of getting rid of some of the larger pieces, which might with difficulty pass along the urethra. Others prefer leaving them to be washed out by the urine. Mr. Clover's suction apparatus is a simple and efficient means of removing the fragments.

In the after treatment the patient should be kept perfectly quiet in bed. A catheter may perhaps have to be passed to draw off the water. If inflammatory symptoms arise, they must be met by fomentations; while pain and irritability are allayed by opium.

Stone in women is comparatively a rare disease. For this several reasons may be assigned. Their diet is less stimulating, the urine is less concentrated, the urethra is more capacious, and allows small stones to pass; and women are less subject than men to those diseased states of the bladder which often give rise to phosphatic concretions.

Calculus in the female presents much the same train of symptoms as in the male.

Treatment.—The stone should, if possible, be crushed. If there is some reason for not performing lithotrity, the urethra may be dilated. If this is insufficient, dilatation may be combined with a small incision through the anterior part of the urethra. Or the bladder may be opened from the vagina, and the case treated subsequently as a vesico-vaginal fistula. But it is much better to avoid a cutting operation, if possible; for it is likely to be followed by incontinence of urine, which may make the patient miserable for months or years.

PHIMOSIS

means an abnormal contraction of the free border of the prepuce. It may be congenital, or it may be caused by the cicatrization of ulcers or chancres. When it is present the præputial secretion is apt to be retained under the foreskin, where it gives rise to much irritation, and to occasional attacks of inflammation, with discharge (*balanitis*). Phimosis is often the exciting cause of cancer of the penis.

Treatment.—Warm water should be injected regularly and habitually under the foreskin. This sometimes effects a great improvement. But in most cases an operation will be required. If the foreskin is long and tight, or if it is thickened by cicatrices, it should be drawn forward, held between the blades of a forceps, so as to protect the glans penis, and cut off evenly by one sweep of the knife. If, however, the case is less severe, it will suffice to slit up the prepuce on its dorsal aspect as far as the base of the glans. This may be done by introducing an oiled director underneath the foreskin, and passing upon it a curved, sharp-pointed bistoury, piercing the skin, and cutting from within outwards. The mucous membrane will probably require a second incision, for the chief seat of the constriction is there; it should then be stitched to the skin, round the line of the wound, and water-dressing applied.

PARAPHIMOSIS.

When a tight foreskin is drawn over the glans and allowed to remain there, it constitutes the condition known as paraphimosis. The penis is constricted; the skin becomes œdematous; and the mucous lining of the prepuce and the glans become congested. If this state of things is allowed to continue, ulceration or sloughing takes place.

Treatment.—The surgeon, having oiled the parts, takes the penis between the fingers of both hands, and draws the constriction slowly but steadily forwards; at the same time, with his thumbs, he compresses the glans, and pushes it backwards. Sometimes the constriction may have to be divided with a knife, before reduction can be effected.

HYPOSPADIAS AND EPISPADIAS.

Sometimes the urethra, from a congenital malformation, terminates on the under surface of the penis before it reaches the point of the glans. This is termed *hypospadias*. When it presents itself in a somewhat similar way on the dorsal aspect, it is called *epispadias*. The malformation may be very slight; or it may extend, in the one case, to the scrotum; in the other, to the anterior wall of the bladder (*extroversion of the bladder*).

Treatment.—When the deformity is only slight, it does not in any way interfere with the natural functions of the urethra, and requires no treatment. When it is extensive, the patient may have to wear a mechanical contrivance to protect the parts; or an attempt may be made to cure the deformity by means of a plastic operation.

CANCER OF THE PENIS

occurs only in those who are advanced in life. It may often be traced to the irritation caused by congenital phimosis. It generally takes the form of an epithelial growth.

A small tubercle, or ulcer, forms on the inner surface of the prepuce, spreads, and implicates the glans. Gradually the growth increases in size, until it presents a rough, irregular mass, which discharges an offensive matter. The lymphatics of the penis become swollen, and the glands in the groin are enlarged. If the orifice of the urethra is involved, micturition may be difficult; or there may be complete retention.

The only *treatment* worth mentioning is early and entire removal. The penis should be amputated above the seat of disease.

Amputation of the penis.—The surgeon takes the penis in his left hand, and puts it on the stretch, while he removes the disease with one sweep of the amputating knife. The bleeding points must be ligatured. The mucous membrane of the urethra should then be nicked, so as to divide it into four equal flaps, and stitched to the margins of the skin. If this is done, there will be no fear of the troublesome contraction of the orifice, which sometimes follows the operation.

HYDROCELE

is the name given to a collection of serous fluid in the tunica vaginalis. Sometimes the disease is traced to an injury, or a strain, or an attack of orchitis. Sometimes it arises without assignable cause.

Symptoms.—The swelling takes place gradually. It beg from the bottom, and slowly extends upwards. The result tumour has a pyriform shape, and a smooth, regular outline. is free from pain or tenderness, but there is a feeling of wei and dragging. Except in certain rare cases, it does disappear when the patient lies down. It is translucent, elas and fluctuating. The testicle generally lies at the back, aln surrounded by fluid. It is never found lying free below swelling, as in the case of rupture. No impulse is communica to the tumour by coughing.

The fluid consists of serum of a pale yellow or straw colo sometimes it is mixed with blood; and sometimes it is turbid w fibrinous flakes. The average quantity present is about ten twelve ounces.

The *treatment* is either palliative or radical. The pallia treatment consists in tapping the swelling simply; the radical tapping it and injecting a stimulating fluid, such as the tinct of iodine. By this means it would appear that the healthy fu tions of the serous membrane are restored.

In performing the operation of tapping the surgeon grasps tumour firmly behind with his left hand, so as to make it te and prominent in front. He then pushes the trochar and car in, at right angles to the long axis of the swelling; and as s as he feels that the point has entered the cavity, he direct obliquely upwards. He then withdraws the trochar, and all the fluid to flow through the canula. If he desires to inject sac, a syringe is fitted to the canula, the fluid is thrown in, the canula is removed. The injection, which is generally u consists of equal parts of tincture of iodine and water—ʒ each. The scrotum should be lightly shaken, so as to bring fluid into contact with every part of the tunica vaginalis, there it should be allowed to remain. When a hydrocele is jected, there is generally a good deal of inflammation. This sides in the course of a few days. In most cases a radical is effected, and the normal balance between secretion and abs tion is restored.

Congenital Hydrocele.—Infants are liable to the ordi form of hydrocele; but they are also subject to another vari known as congenital hydrocele. The communication between peritoneal cavity and the pouch which goes to form the tu vaginalis remains open, and the fluid occupies the same plac the bowel in a congenital hernia. The two diseases, conge hydrocele and congenital hernia, are very apt to occur togeth

Treatment.—In infants the ordinary closed hydrocele may be cured by the use of a discutient lotion. (F. 15. 18.) In the congenital hydrocele the child should wear a truss, so as to obliterate the opening into the peritoneal cavity.

Encysted Hydrocele.—Here the fluid does not form in the tunica vaginalis, but in a cyst connected with the testis or epididymis. Small cysts in this situation are very common. Sometimes they increase to an inconvenient size.

Symptoms.—In many respects they resemble the common hydrocele. But they do not attain the same bulk, and they may generally be felt to be offsets from the testis or epididymis. It is a curious fact that spermatozoa are often found in the fluid they contain.

Treatment.—The cyst may be punctured simply, or punctured and injected; or a seton may be passed through it; or, if milder measures fail, it may be laid open and allowed to granulate.

Hydrocele of the Cord.—A tumour containing serous fluid occasionally forms in or below the inguinal canal. Sometimes it is fixed; sometimes it may be pushed back into the abdominal cavity. It receives no impulse from coughing, is smooth, elastic, and fluctuating. In some cases it appears to be formed by an extension of the pouch of peritoneum, which dips into the internal abdominal ring. In other cases it seems to be developed in a cyst connected with the coverings of the cord.

The *treatment* consists in passing a seton through it, or laying it open and allowing it to granulate.

HÆMATOCELE

is the name given to a collection of blood in the tunica vaginalis.

It is generally traumatic, the result of a blow or wound.

Symptoms.—The tunica vaginalis becomes gradually distended; the testicle is compressed, and, if the disease persists, it is very apt to waste. If the hæmatocele has lasted for a considerable time, the fibrine of the blood may be deposited in layers on the surface of the tunica vaginalis, so that it resembles the sac of an aneurism.

Treatment.—When the case is recent, rest, pressure, and discutient lotions should be tried. If these means fail, the tumour may be tapped, or a wire seton passed through it. As a last resource, it must be laid open, the clots turned out, and the cavity allowed to granulate.

VARICOCELE

is the name given to the swelling which is formed by a varicose state of the veins of the spermatic cord. It is caused by anything which retards the venous circulation—*e.g.*, debility, constipation, &c. The left side is more often affected than the right; partly because the veins of the left side are longer than those of the right, and partly because they are subject to the pressure of the distended colon.

Symptoms.—A swelling is felt, which has been aptly compared to worms in a bag. It is irregularly pyramidal, its base resting on the testis, and its apex pointing to the external abdominal ring. It subsides to a great extent when the patient lies down, but soon returns when he stands up. It is accompanied by a sensation of weight, and dragging pain in the back and loins. These feelings are aggravated when the patient takes active exercise. After it has existed for some time it is apt to cause atrophy of the testicle.

Treatment.—The disease may be palliated by wearing a suspensory bandage, and bathing the parts frequently with cold water. At the same time, the general health should be improved by tonic medicines.

The radical cure of varicocele is effected by obliterating the veins, on the same principle that we treat varix of the lower extremity. Our object is to compress the coats of the veins, so as to excite adhesive inflammation. If the compressing force is continued, the coats ulcerate, and are divided at the point of pressure. A great many methods are practised, but the principle is the same in all. Some pass a hare-lip pin underneath the veins, and then twist a thick silk over it, in the form of a figure-of-8. Others put a noose of silver wire round them by means of a needle, which enters the scrotum and emerges at the same point, and then twist it, so as to compress the veins. A few turns are given to the wire every day, and thus it soon cuts its way out. Some tie the veins in two places, and divide them subcutaneously between the ligatures. But this seems to be both unnecessary and hazardous.

Before undertaking any of these operations, the spermatic cord should be carefully held aside by an assistant. It may be easily distinguished by its hard, even feeling, like whipcord.

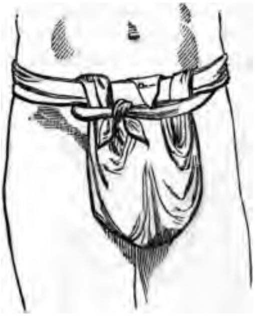
ACUTE INFLAMMATION OF THE TESTIS.

Orchitis.—The testicle is liable to both acute and chronic inflammation. The acute variety is most often seen as an accompaniment of gonorrhœa; but it may also result from blows, or it may arise in the course of small-pox or mumps.

Symptoms.—There is pain, with a dragging sensation in the cord, heat, swelling, redness, exquisite tenderness, pains in the back, loins, and perineum. There is great constitutional disturbance, with nausea and vomiting. When the attack is connected with gonorrhœa, the inflammation extends along the *vas deferens;* and then it would appear to be the epididymis which is chiefly affected (*epididymitis*). The discharge from the urethra generally ceases while the inflammation in the testis is at its height. This seems to be due to counter-irritation, and not to metastasis.

Treatment. — Perfect rest in bed must be enjoined, and the testis raised on a small pillow. Fomentations — plain or medicated — should be assiduously applied. If the tunica vaginalis is much distended, the fluid may be evacuated by means of a small trochar. At the same time, purgatives and diaphoretics should be given, with opium to allay pain and procure sleep.

Fig. 113.



Handkerchief bandage for the scrotum.

When the acute stage has passed, and nothing remains but hardness and swelling, the scrotum should be supported by a suspensory bandage; strapping the testicle evenly and firmly will also be found of the greatest benefit.

Bandages for supporting the Scrotum.—The scrotum may be supported in various ways. A suspensory bandage, such as those which are sold at the instrument makers, is perhaps the best. But if it is impossible to get one of these, or if the scrotum is so much enlarged that it cannot be contained in one, a very useful substitute may be made with a broad roller and a handkerchief. The roller is passed round the waist, and fastened in front. The handkerchief should then be folded in a triangular form, and the centre of the base of the triangle applied to the perineum behind the scrotum. The corresponding ends are now drawn up, one on each side of the scrotum, and tied to the waistband in the way represented in Fig. 113. The apex of the triangle is then brought up in front of the scrotum, passed round the waistband, and fastened with a pin or in a knot.

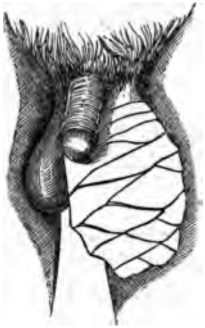
CHRONIC INFLAMMATION OF THE TESTIS

may follow an acute attack, or it may be caused by disease of the urethra, or it may depend upon a syphilitic taint.

Symptoms.—The testicle becomes enlarged and hardened. There is but little pain or tenderness. The whole organ is generally affected equally. There is usually more or less effusion into the tunica vaginalis. One or both testicles may be the seat of disease. There is deposit of yellow, cheesy, fibrinous matter in and between the tubules.

Treatment.—If there is disease of the urethra, we must endeavour to cure it, and then the inflammation of the testicle will subside by itself. If there is a syphilitic taint, blue ointment should be rubbed in locally, while a mild course of mercury, or of the iodide of potassium, is given. Sometimes small doses of grey powder, or of corrosive sublimate, with tonics, may promote the absorption of the effused material. Whatever remedies are tried, rest in the horizontal position, support, and even pressure by strapping, should always be used.

Fig. 114.



Strapping the testicle.

Strapping the Testicle.—This is generally done in the following manner:—First of all the enlarged testis is separated from the rest of the scrotum, and a strip of wash-leather plaster, about an inch in breadth, is rolled round the spermatic cord and vessels, so as to form a collar which isolates the testicle. The surgeon then prepares a number of strips of the ordinary diachylon plaster, about half an inch wide, and long enough to go once and a half round the affected part. These should be well warmed or dipped in hot-water, and then applied to the testicle in regular order. (Fig. 114.) The first two or three strips should be laid on vertically, from behind forwards, and tight enough to exert a slight degree of compression. Then a sufficient number of strips should be placed in the same way, from side to side, beginning on the inside, passing round the lowest point of the testis, and terminating on the outside. If any intervals are left between these vertical strips, they should be covered in a similar manner; after which the plaster should be rolled in a circular or spiral way round the testicle, until it has been completely and firmly enveloped. In the course of a few days it will be found that the strapping has become loose, and then it must be removed, and fresh plaster applied.

Sometimes the inflamed testicle softens at one point, an abscess forms and bursts, or is opened. When this happens, the tubular structure of the gland is apt to protrude as a fungus (*hernia testis*). In such a case, pressure should be made by means of a pad, or the fungus should be freely touched with caustic. If these means fail, the case should be treated in the way that Mr. Syme recommends. The skin around the protrusion should be dissected back, the edges pared, brought together, and united over the fungus, so as to cover it.

Scrofulous testicle.—The scrofulous habit sometimes manifests itself in the testicle. A slow and chronic inflammation takes place, with deposit of tubercular matter in and between the seminiferous tubules. The gland enlarges irregularly, without pain or tenderness, and its outline becomes rough and nodulated. Here and there, it softens and breaks down. Abscesses form, and open externally, perhaps allowing the structure of the testicle to protrude as a fungus. Such abscesses are apt to burrow in all directions, disorganizing the whole gland, and giving rise to an exhausting discharge.

Treatment.—The local disease must be met by rest, support, even pressure, and absorbent ointments. When abscesses form, they must be opened, and the resulting sinuses treated by astringent or stimulating lotions. (F. 11, 19, 22.) If the gland is thoroughly disorganized, and the discharge is exhausting the patient, the entire testicle will have to be removed.

Cystic sarcocele.—In all these solid tumours of the testis, whether the enlargement be of a simple, a syphilitic, a scrofulous, or a malignant kind, cysts are apt to be developed by the dilatation of the seminiferous tubules. Such cysts may vary greatly in size; usually they are about the size of a marble. When many of them are present in the tumour it is called by the generic name of *cystic sarcocele.* But the precise nature of the solid substance in which the cysts are embedded is, after all, the important point for diagnosis.

CANCER OF THE TESTICLE

is generally of the medullary variety.

The early *symptoms* are obscure, because they are common to many of the tumours which are met with in this situation. The testicle enlarges from the centre, feels smooth, hard, and heavy. The patient complains of a sensation of weight and dragging. The growth makes steady progress. The skin of the scrotum becomes distended and purple. Soon it becomes adherent, softens, ulcerates, and then the cancer protrudes in a fungous mass. When the tumour begins to increase rapidly, there is no longer any doubt about the diagnosis.

Treatment.—As soon as the nature of the tumour has been ascertained, the entire testicle ought to be removed.

Castration is performed thus:—If the skin is free, a single long incision is made from the external abdominal ring to the bottom of the scrotum; or, if the skin is involved, a double elliptical incision will be required. Partly by tearing, and partly by a few light touches of the knife, the testicle is raised from the cellular bed in which it lies. The upper part of the cord should then be transfixed with a hook, or held by an assistant, while the tumour is cut off. Unless this is done, there is danger of the cut end of the cord being retracted within the inguinal canal. Two or three bleeding points in the cord and scrotum will have to be secured by ligatures or by torsion. The wound should be lightly dressed, and allowed to granulate.

CANCER OF THE SCROTUM

(*Chimney-sweep's Cancer*) is of the epithelial variety, and seems to be due to the irritation which is caused by the soot in constitutions that are predisposed to malignant disease.

It begins as a wart or tubercle. In this state it may remain for a long time. Presently it becomes red, and thinned on the surface, bursts, ulcerates, and spreads rapidly in small warty excrescences. If it is allowed to remain, it gives rise to a foul and offensive ulcer, infects the inguinal and pelvic glands, and impairs the general health.

The only effectual *treatment* is early and complete removal. Under any circumstances, the prognosis is far from favourable.

VESICO-VAGINAL FISTULA

means a communication between the vagina and the bladder. It is generally the result of sloughing, caused by a difficult and tedious labour.

Treatment.—The patient should keep herself scrupulously clean, and when she passes water she should, if possible, lie on her face, or support herself upon her hands and knees. If an operation is undertaken, it may be performed thus:—The patient should be placed in the lithotomy position, or else made to lean on her knees and elbows, supported on pillows. The vagina should be held open by suitable retractors. The surgeon then pares the edges of the fissure, throughout their whole length, and brings the raw surfaces accurately together by means of wire sutures. A catheter should be kept in the bladder, so as to prevent the accumulation of urine. The spasmodic action of the bladder and bowels should be allayed by repeated doses of opium.

RUPTURED PERINEUM.

The perineum is sometimes ruptured during parturition. When this happens, the rent should be united immediately. If this is not done, the operation will have to be delayed until the patient is convalescent, and in the meantime she will suffer much inconvenience and distress. Sometimes the tear stops at the sphincter ani; sometimes it extends quite through into the rectum.

Treatment.—The patient may be placed in the lithotomy position, or simply laid on her side with the legs drawn up. The edges of the rent are then to be thoroughly pared, and brought into accurate apposition by means of the quilled suture. (See Fig. 23.) If the operation is done at once, it will not be necessary to pare the edges. If the sphincter has been torn, its contractions will be apt to prevent union. It must therefore be divided on each side of the original wound. A catheter should be kept in the bladder, and opium given to prevent the action of the bowels.

GONORRHŒA

is the term applied to a specific inflammation of the urethra or vagina, the result of impure sexual intercourse, and accompanied by a purulent discharge. After exposure to infection, an uncertain period elapses before the symptoms show themselves. On an average it may be set down at four or five days.

The disease may be divided into three periods—(1) That of accession; (2) that of acute inflammation; (3) that of decline.

Symptoms.—(*First stage.*)—In the male, the disease comes on with slight heat and irritation at the point of the penis. The glans becomes congested, and of a bright red colour, the lining membrane of the urethra is swollen, and the orifice partly closed. There is a thin, whitish, watery discharge. The urine is passed with difficulty, and the stream is diminished, twisted, and forked. These symptoms are accompanied by a good deal of dull, aching pain in the back, loins, and testicles, and there is more or less pyrexia.

(*Second Stage.*)—Soon, these symptoms become aggravated. The discharge becomes thick, puriform, and perhaps of a greenish or reddish tinge. There are prolonged and painful erections at night. Sometimes, during erection, the penis is curved, as if it were tied down with a string (*chordee*)—a state of things which is exquisitely painful, and is probably due to deposit of lymph in the corpus spongiosum, which interferes with the uniform expansion of the organ. Sometimes the glans is excoriated, and emits a purulent discharge (*balanitis*). Sometimes the prepuce is œdematous, and perhaps fixed in the condition of phimosis or paraphimosis. Abscesses may form in the substance of the penis, and burst either internally or externally. The lymphatic glands in the groin may become inflamed and suppurate (*bubo*). Either testicle may become acutely inflamed (*orchitis*). These are some of the complications which may arise in the course of a severe case of gonorrhœa; and when the disease is on the decline, there are often rheumatic pains of an obstinate kind about the joints of the extremities—(*gonorrhœal rheumatism*).

(*Third stage.*)—When the inflammation has run its course, it is very likely that a thin, muco-purulent discharge (*gleet*) may remain for some time, and prove very intractable.

Inflammation may, however, be excited in the mucous membrane of the urethra by ordinary causes—external violence, the use of instruments, &c. The disease is then called *urethritis.* It may run much the same course as gonorrhœa.

Treatment.—If the disease is in its first stage, the patient should be advised to take a purge, to restrict his diet to what is plain and unstimulating, to bathe the parts frequently with cold water, and to use a slightly astringent injection every three hours or oftener. (F. 13, 20, 24.) Strong applications—whether in the form of injections or ointments—are attended with great risk, and ought not to be used. A mild lotion injected at short intervals, as I have recommended in the treatment of ophthalmia neonatorum, is perfectly safe and very effectual. Cubebs or copaiba may be given at the same time, and these means may have the effect of cutting short the attack. (F. 38.)

Mode of injecting.—The patient should raise the penis between the forefinger and thumb of his left hand, holding it near the point. He should then carefully introduce the nozzle of a glass syringe into the urethra for the space of an inch or so, and fix it in that position by compressing it gently with his left forefinger and thumb. He then slowly pushes down the piston with his right hand. The injection should be allowed to remain in the urethra for a few minutes. As soon as the syringe is taken away, and the left hand removed, the elasticity of the urethra will expel the fluid that has been thrown in.

During the second stage, when the symptoms are those of acute inflammation, the treatment should be strictly antiphlogistic. The patient should keep the house, and avoid exercise. No injections should be used, unless they be of tepid water. The parts should be constantly fomented with flannels, wrung out of hot water. In milder cases it may suffice to envelope the penis in lint dipped in warm water, and covered with a piece of oil silk. The bowels should be kept open by small and repeated doses of sulphate of magnesia—ʒj three times a day, or a seidlitz powder every morning; while the urine is diluted, and its acidity lessened, by alkaline or mucilaginous drinks—soda water, or imperial drink (F. 89), or barley water, or linseed tea (F. 88) to which a little nitre or carbonate of potass has been added. By this means the scalding pain in micturition will be much reduced. Chordee may be relieved by a full dose of Dover's powder at bed-time, or by smearing the penis with extract of belladonna, or by a mixture of camphor and opium in a pill or suppository.

If there is retention of urine, from the swollen state of the mucous lining of the urethra, fomentations or warm hip-baths should be assiduously used, and opium suppositories introduced into the rectum. It may even be necessary to leech the perineum. If these measures fail, then, and not till then, a full-sized catheter should be passed into the bladder.

If the lymphatic glands in the groin become inflamed (bubo), they should be treated by rest, fomentations, and leeches. If matter forms, an incision should be made in a direction parallel with Poupart's ligament.

When the acute symptoms have subsided, and the discharge has become thin and muco-purulent, we return to the use of mild astringent injections and cold sponging. If the patient's stomach will bear it, he should again take cubebs or copaiba. The bowels should be regulated, and the diet must still be restricted; all alcoholic and stimulating drinks should be forbidden. The same treatment and manner of life should be rigidly pursued for a fortnight after the discharge has ceased.

If a thin watery discharge—a *gleet*—persists, it must be treated by varying the injections—trying the acetate of lead, the sulphate or chloride of zinc, the nitrate of silver, alum, &c., either in turn, or by combining them (F. 20, 22, 23, 24). At the same time, it is of great importance to improve the general health by tonics and a change of air. Sometimes much benefit results from passing a full-sized catheter every three or four days.

If *gonorrhœal rheumatism* follows the attack, it should be treated by fomentations, alkalies, hot-air baths, diaphoretics in large and repeated doses, and by applying blisters, or leeches, in the neighbourhood of the affected part. When the acute symptoms have subsided, the iodide of potassium may be given with advantage. A visit to the thermal springs of Bath, Buxton, or Aix-la-Chapelle is often of great benefit.

Warts (*condylomata acuta*) often follow gonorrhœa, particularly if the patient has allowed the discharge to lodge beneath the foreskin, or if there has been much inflammation of the glans or prepuce. They are generally situated along the corona glandis, or on the frænum. When they are very numerous, and of large size, they may be mistaken for cancer of the penis.

The *treatment* consists in snipping them off with scissors, and then touching the bleeding points with lunar caustic. When they are few, small, and scattered, much benefit may be derived from the use of a calomel ointment (F. 76), or from a lotion of corrosive sublimate.

Gonorrhœa in the female.—Gonorrhœa in women is altogether a less formidable malady than it is in men. This arises from the fact that the parts concerned are comparatively large and simple. We have not to deal with a long, narrow, and complicated canal like the male urethra.

The *symptoms* of gonorrhœa in women are much the same as those which have been already described; only the disease is less acute, and is more apt to degenerate into a chronic gleet. The principal complications which may arise are bubo, and ulceration of the neck of the womb.

When a woman is affected with gonorrhœa, the discharge may proceed either from the external parts—the labia, nymphæ, and meatus urinarius, or from the vagina, or from the cervix uteri. In the latter case, it will probably be associated with superficial ulceration.

Gonorrhœa must be carefully distinguished from other discharges to which women are subject: (1) from *leucorrhœa* (*fluor albus*), a thick, white discharge, derived from the cervix uteri; and (2) from *vulvitis*, an inflammation of the external parts of generation, depending on ordinary causes, as want of cleanliness, intestinal irritation, &c. This is not uncommon among the children of the poor, and is of great importance in a medico-legal point of view. Parents are apt to think that their children have been abused, when, in truth, all they want is a warm bath or a vermifuge.

Treatment.—Gonorrhœa in the female must be treated on the same general principles that guide us in dealing with the disease in the male. During the acute stage, rest in bed, fomentations, warm hip-baths, low diet, purgatives, and salines, are the remedies most to be relied on. Subsequently, the vagina should be syringed with astringent lotions, composed of the acetate of lead, the nitrate of silver, the sulphate of zinc, or alum. (F. 20, 22, 23, 13.)

If the discharge is very intractable, it may be necessary to examine the cervix uteri by means of a speculum; and, if need be, to touch it with the lunar caustic, or to apply some other medication.

SYPHILIS

is the name applied to the more severe form of the venereal disease, which is usually attended with a breach of surface. An important division is made according to the nature of the sore which is present.

1. The simple, soft, non-infecting sore, or local contagious ulcer.

2. The indurated, infecting, Hunterian chancre.

We shall consider each of these separately. But in doing so, it will be impossible for us to do more than mention the leading features of each case. The investigation of syphilis is full of interest. It is a subject which has made, and is still making, great progress. Many theories have been propounded, many guesses at the truth have been made, but into these we cannot here enter. We must confine ourselves to a statement of the most recent views on the subject.

1. *The simple, non-infecting sore, or soft chancre, or local contagious ulcer*, begins as a small, irritable pimple. The period of incubation of the virus is short. Indeed, it is not improbable that it begins to work from the moment of its application. At any rate, the pimple generally shows itself within forty-eight hours. It rapidly runs on to suppuration, forming a pustule. This bursts, and gives rise to a superficial ulceration. The sore is usually situated in the sulcus between the prepuce and the glans, particularly at the sides of the frænum. The base of the ulcer is soft; it can be easily compressed between the fingers; and the discharge from the surface contains pus globules, mixed with the débris of the tissues. The lymphatic glands in the groin soon become inflamed, and generally suppurate. But in most cases the mischief stops here. The system does not become infected, and secondary symptoms do not follow. Sometimes, however, the sore spreads deeply and rapidly, with phagedænic action. Sometimes, it creeps over the surface in the form of a serpiginous ulceration. Sometimes, a large portion of the tissues, and even the whole body of the penis, sloughs (sloughing phagedæna).

The soft sore is frequently multiple; several may be present at the same time. It is auto-inoculable; that is to say, if the matter of the sore is inoculated on another part of the individual who is affected, it will produce a sore like the original one. And if the matter is inoculated on a second person, it will have the same effect. As often as these experiments are repeated, sores may be produced. The disease is strictly local, and at the same time highly contagious.

2. *The infecting sore, the indurated, Hunterian, or true syphilitic chancre,* differs in many respects from the foregoing. It begins as a pimple or crack. Around this, induration takes place, the pimple bursts, and an open sore, with a hardened base, is the result. Ulceration and suppuration are no essential parts of the disease, though they may be present from some local cause of irritation.

The virus has a lengthened period of incubation (15 to 25 days) before the sore is developed; and then a second and shorter period (10 or 12 days) elapses before the induration is complete, and the glands become enlarged and hardened. The sore is generally single. The secretion is said to contain no proper pus-globules. The affection of the glands is usually multiple, and they show no tendency to suppurate. The disease gradually pervades the whole system, and may be recognised by a similar indolent enlargement of the glands in the axilla, under the occiput and elsewhere. Secondary and tertiary symptoms follow; to these we shall return presently. The sore is not auto-inoculable—at least, after systemic infection has taken place. The system is so far under the influence of the virus, that the inoculation produces no effect; and as a rule, the patient is incapable of suffering from the same form of the disease a second time. The virus from one individual cannot be inoculated on another, who is still suffering from the effects of an infecting sore. The disease, though at first local, soons becomes systemic, and then the patient is proof against inoculation.

Such are the two varieties of specific sores which are recognised by modern surgeons. But, in practice, it is very common to meet with *mixed cases,* where we can only suppose that there has been a double inoculation at the same time; or that an inoculation of one kind has been speedily followed by an inoculation of the other kind. These cases are so perplexing, that some distinguished surgeons doubt altogether the doctrine of a "duality of poisons;" and hold that all sores—whether hard or soft—depend upon one and the same virus, which produces different effects, according to the constitution of the patient, the situation of the sore, and other accidental circumstances.

Treatment of soft, non-infecting sores.—If a case presents itself where there is a suspicious-looking pimple, which has appeared within a day or two after an impure connexion, it should be touched with strong nitric acid, and lightly dressed. When the *eschar* separates, a healthy granulating sore will probably be left. If the sore is in a more advanced stage, or if it is irritated and inflamed, this treatment is inapplicable. If more than a very short time has elapsed from the date of the appearance of the sore, it is highly improbable that we shall succeed in preventing systemic infection in the case of an indurated chancre.

Supposing the sore is well formed when it is first seen, our treatment must depend upon the characters which it presents.

If it is a soft sore, irritation of every kind should be avoided, while some simple stimulating lotion or ointment should be applied. If the inguinal glands become inflamed, they must be treated by rest, fomentations, leeches; and, if suppuration takes place, an incision must be made.

If ulceration spreads rapidly and deeply (phagedæna), the surfaces must be destroyed with nitric acid, and afterwards dressed with stimulating lotions. At the same time the general health must be supported by tonics and a nutritious diet.

If sloughing occurs (sloughing phagedæna), poultices must be applied until the dead tissues separate, and then the raw surfaces should be dressed with stimulating lotions. A lotion of the tartrate of iron forms an excellent application in these cases. If there is much constitutional disturbance, it must be met by aperients, salines, and opiates.

Treatment of hard chancres.—If, on the other hand, the sore is a hard one, and presents an indurated base at the time it is seen, the treatment must be different. In a case of this kind, some surgeons think it best to heal the local sore; and, when secondary symptoms follow, to deal with them as they arise. Others endeavour to eliminate the poison from the system at once, so as to prevent the occurrence of secondaries.

And here we are met by an important question—Should mercury be used or not? Has it any specific influence over the syphilitic poison?

These are questions upon which the most opposite opinions have been entertained. That mercury has *some* specific influence over the poison of syphilis seems clear from the rapid and complete cure which it effects in cases of infantile syphilis. On the other hand, there can be no doubt that by far the greater number of chancres will heal without mercury; that it is a medicine which is capable of doing great mischief; that it must be given with caution, and that it should never be pushed to extremes.

Mercury may always be employed locally, provided the sore is not in an inflamed or irritable state, in the form of blue ointment, or of the black or yellow wash.

If the patient is broken in health from dissipation, if he is enfeebled by privation or disease, if he is of a strumous or cachectic habit of body, mercury should either be withheld altogether, or given with very great caution, lest its depressing effect should aggravate the malady.

If there is no objection to its use, it may be administered either by the *mouth*, or by *inunction*, or by *fumigation*.

If we desire to bring the patient under the influence of mercury, the best preparations are the blue pill, or calomel in combination with opium (F. 70). If our aim is to produce a slight but continued effect, it will be better to give Plummer's pill, or grey powder, or the corrosive sublimate (F. 44). These are the preparations which are most suitable for internal use.

Sometimes mercury given by the mouth irritates the stomach, and purges the patient. When this is the case, it may be employed as an inunction. A drachm of blue ointment may be rubbed into the armpits, or into the inside of the thighs, twice a day; or the same quantity may be spread on a roll of lint, and worn round the leg, or round the waist. This is the best way of administering mercury to infants.

Mercury may be used as a fumigation, by causing the patient to undress, and sit upon a cane-bottomed chair, beneath which ten grains of calomel are volatilized over a spirit-lamp or upon a hot brick. A blanket should be thrown over both the patient and the chair, and as soon as all the mercury has disappeared, he should wrap himself in the blanket and step into bed.

When mercury produces its characteristic effects upon the constitution, the gums become red and spongy, the tongue swells, the sublingual glands become enlarged, and there is a profuse flow of saliva from the mouth. At the same time the breath exhales a heavy, sweetish, and very characteristic odour. When mercury is pushed to an extreme, and salivation is kept up for a length of time, ulceration of the mouth and necrosis of the bones are apt to follow; but cases in which these untoward results have been brought about are very rarely seen at the present day.

If we desire to bring the system under the influence of mercury, we should content ourselves with keeping up a slight action on the gums. It is never necessary to go farther than this.

The iodide is a very useful preparation of mercury. It seems to combine the specific effect of both the iodine and the mercury (F. 43).

While a patient is taking mercury he should live well; he should have plenty of plain nutritious food, and wear a sufficiency of warm clothing.

BUBO

is the term applied to enlargement or inflammation of the lymphatic glands which lie above Poupart's ligament, consequent upon venereal disease. We have already seen that it is a frequent complication of gonorrhœa, but it is also met with in both the varieties of syphilis.

A bubo that is due to gonorrhœa, or to the irritation of a soft venereal sore, is acutely inflamed, and very prone to run on to suppuration. The irritation may manifest itself in one groin or in both. One lymphatic gland alone may be affected or several; and when suppuration takes place the pus may burrow underneath the skin from one to the other.

The multiple and indolent enlargement of the same glands which is so characteristic of an infecting sore has been described already.

Treatment.—The treatment of the indolent buboes which result from an Hunterian chancre is constitutional rather than local. But when the glands are acutely inflamed the surgeon should endeavour to prevent them from suppurating. With this view the patient should be directed to abstain from walking and to give himself as much rest as possible; at the same time evaporating or discutient lotions (F. 18, 15) should be constantly applied. If suppuration takes place, the abscess should be opened by an oblique incision, parallel to Poupart's ligament, and poultices or water-dressings applied. If burrowing takes place, the sinuses ought to be laid open, and healed from the bottom. When cicatrization has occurred, and nothing remains but an indurated state of the tissues, even pressure by means of a pad and bandage is of great service.

In keeping dressings upon the groin, as well as in exerting pressure and in various other cases, the spica or figure-of-8 bandage for the groin is of great use. We shall therefore take this opportunity of explaining it.

Fig. 115.

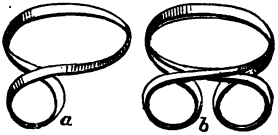
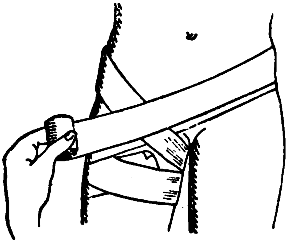


Diagram of spica bandages.

*Figure-of-*8 *bandage for the groin.*—This bandage is frequently spoken of as the *spica*, from some fancied resemblance which it is supposed to bear to the arrangement of the grains in an ear of corn. But as the word *spica* conveys no distinct meaning, we have thought better to call it, what it really is, *a figure-of-8* bandage for the groin.

The bandage may be applied either to one groin or to both. When it is applied only to one side it is called a single figure-of-8 for the groin (single spica, Fig. 115, *a*); when to both sides, a double figure-of-8 for the groin (double spica, Fig. 115, *b*).

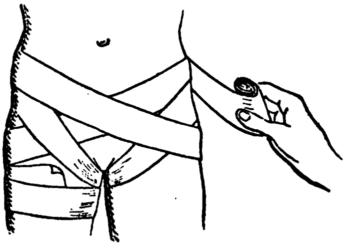
Fig. 116.



Single spica bandage.

To apply the single figure-of-8 to the groin the surgeon lays the end of the roller on the inside of the thigh of the affected side, and conducts the roller once round in a circular form so as to fix the end of the bandage. He then brings the roller up the inside of the thigh and along the fold of the groin, taking care to adjust any pads, dressings, &c., that it is intended to retain. Then he carries it on, round the back of the pelvis to the opposite side, and obliquely across the abdomen, over the pubes, to the outside of the thigh on the affected side, and then continuing it under the thigh he completes the first figure-of-8—one loop of the 8 embracing the pelvis, while the other surrounds the thigh. (Fig. 116.) The same steps may then be repeated as often as they are necessary.

Fig. 117.



Double spica bandage.

In applying the double figure-of-8 to the groins the surgeon begins precisely as in the foregoing case, but after he has completed one figure-of-8 and has carried the bandage for the second time round the back of the pelvis, he brings it down along the opposite groin to the inner side of the corresponding thigh. He then conducts it round the back of the thigh to its outer side, and then obliquely upwards across the pubes and abdomen to the other side of the pelvis, in this way completing the second figure-of-8. These steps may be repeated as often as they are necessary, the upper loop of the 8 in each case surrounding the pelvis, while the lower one embraces the right and left thighs alternately. (Fig. 117.) It is important to observe that the turns round the body should fall just below the brim of the pelvis.

In commencing this bandage the surgeon may, if he pleases, begin by taking a turn round the pelvis, instead of round the thigh, in order to get a fixed point from which to start.

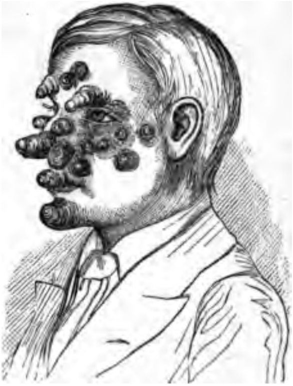
A simpler method of retaining dressings in this situation is by means of *the triangular bandage for the groin.* It consists of a waistband to which is stitched a triangular piece of calico, and to the lower end of the triangle is fastened a strip of narrow roller. When it is applied the waistband is secured, the triangular piece of calico is adjusted over the affected part, and the lower corner, with its strip of bandage attached, is carried under the perineum, and fastened to the waistband at the patient's side (see Fig. 40, *b*).

SECONDARY SYPHILIS.

When the poison of syphilis has infected the constitution, it produces certain secondary symptoms. These symptoms show themselves at a variable period, from two weeks to six months or more, after the primary disease. First of all, the skin and the mucous membranes become affected (*secondary symptoms*), afterwards the bones and internal organs (*tertiary symptoms*).

Constitutional syphilis seldom leads directly to a fatal result—unless it affect the brain or some other vital organ. It is, however, extremely difficult to eradicate, and it often modifies the patient's constitution for the remainder of his life. It is worthy of special notice that the normal secretions of persons having secondary syphilis—*e.g.*, the saliva or the milk—as well as the discharges from secondary sores, can communicate the disease. But when the later stages have been reached, the poison seems more localized, and is less prone to be eliminated from the blood.

Fig. 118.



Syphilitic rupia on the face.

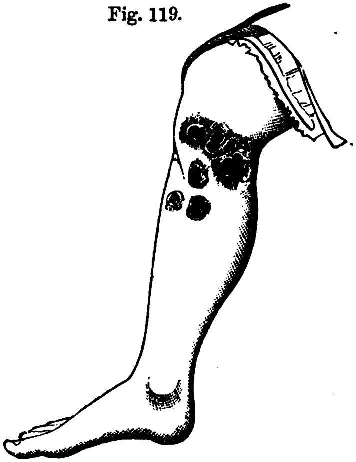
The syphilitic eruptions on the skin (*syphilides*) may take almost any form, corresponding pretty nearly to the ordinary cutaneous diseases. *But they* are all characterized *by* their dull, copper colour; by the fact that they do not itch; by their circular shape and grouping; and by the brownish stains or discolorations which the severer forms leave behind them. Fig. 118 represents a remarkable case of syphilitic rupia in a young man who was lately in Charing Cross Hospital under the care of Dr. Silver.

It would be impossible for us to find space for even a short description of each of the syphilitic affections of the skin, but we may take this opportunity of mentioning that they have been regarded by Mr. Hutchinson and others as analogous to the rashes of the exanthematous diseases. Indeed, syphilis may well be regarded as an exanthem whose march is very slow, and whose stages are very long.

Mucous tubercles (*condylomata lata*) are a peculiar development of the skin, which is apt to occur near the orifices of the mucous canals, especially where the parts are bathed in perspiration, and where irritation is kept up by the movement of two contiguous surfaces: hence they are commonest around the anus and vulva. They form small, soft, flattened tumours, and secrete a thin, offensive discharge, which is probably contagious.

Treatment.—They should be kept very clean, and rubbed with calomel ointment (F. 76), or dusted over with the dry calomel, or bathed with a mercurial wash.

Fig. 119.



Syphilitic sores on the leg.

Syphilitic ulcerations.—Secondary syphilis is particularly prone to manifest itself in the mucous membrane of the pharynx. The patient complains of sore throat. The affection may consist of a mere congestion and excoriation of the mucous membrane of the fauces or tonsils, or it may present a foul, excavated ulcer, with ragged edges, and covered with a greyish yellow slough.

We often see syphilitic ulcers on the legs. They begin in small gummy tumours in the subcutaneous areolar tissue, soften, break, and form a deep ulcer, which is characterized by its circular form, its clean-cut edges, its irregular base, and unhealthy discharge. (Fig. 119.) Such ulcers are often multiple, and one of their favourite situations is the neighbourhood of the knee, so much so that it may be laid down as a general law that sores on the leg about, or above, the knee-joint have usually a syphilitic origin.

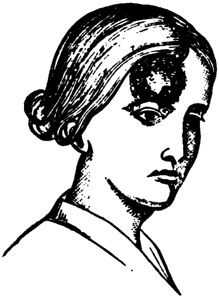
The inside of the mouth, the lips, the tongue, and even the larynx, are liable to be affected by syphilitic ulceration. Cracks and fissures form at the angles of the mouth, and along the sides of the tongue. Whitish or yellowish spots appear on the gums and lining membrane of the cheeks. The mucous covering of the larynx is apt to become ulcerated, leading to impairment of the voice, and even to suffocation.

Treatment.—In all these ulcerative affections, the treatment must be much the same. Cracks and fissures should be thoroughly touched with a pencil of lunar caustic; or, if the ulcerating surface is more extensive, it may be brushed over with a strong solution of nitrate of silver (forty grains to the ounce of distilled water). If the part is in a sloughing and unhealthy state, the patient should use a chlorinated gargle, and the nitrate of silver may be more freely applied. Fumigating the fauces with calomel, directed to the diseased spot by means of a funnel, is often of great benefit. At the same time, the constitutional treatment must not be overlooked. The patient should live well, and, if possible, he should have a dry, mild, bracing air. England during the winter and spring is too cold, damp, and relaxing. Thus a sea voyage, or a residence at St. Leonards, Bournemouth, Malaga, Mentone, or some similar place may often be recommended with great advantage. If the patient is in pretty good general health, and has not already been treated with mercury, a mild course may be prescribed. If, however, his health is broken, or he has been already salivated, then the iodide of potassium should be given, in combination with iron and tonics. (F. 50, 52.)

In syphilitic ulceration of the larynx, the constitutional treatment is of the greater importance, because topical applications are attended with difficulty. If the disease spreads, and suffocation is imminent, it will be necessary to perform tracheotomy.

Syphilitic affections of the bones are among the later, or tertiary, symptoms of the disease. The bones which are most frequently affected in constitutional syphilis are the tibia, the bones of the skull, the clavicle, and the ulna. A slow inflammation takes place in the bone, or in the periosteum covering it. The affected spot is exquisitely tender; there is great pain, which is aggravated at night. By degrees, an oval swelling, a *node* forms, which has at first a doughy feeling, but which afterwards becomes distinctly fluctuating. This gradually involves the skin, and bursts, exposing the ulcerated bone beneath. Fig. 120 was drawn from a young woman, who was lately in Charing Cross Hospital under the care of Mr. Canton. The circular shape of the sore and the exposed bone are well seen.

Fig. 120.



Syphilitic sore on forehead.

If the disease is situated on the skull, it may give rise to irritation of the membranes, and death by meningitis. Or it may furnish an opening through which the brain may protrude, or there may be internal nodes as well as external; and then the cerebral functions may be very seriously impaired.

Treatment.—The great remedy for syphilitic affections of the bones is iodide of potassium. It should be given in combination with tonics, the tartrate, or the ammonio-citrate of iron, for example (F. 52); and the patient should have plenty of plain, nutritious food, for unless he has a certain amount of *vis vitæ* he cannot resist the violence of the disease. The local pain must be relieved by blisters, or leeches; and opiates may be given at bedtime. If suppuration has taken place, a small valvular incision should be made, and the matter evacuated.

INFANTILE SYPHILIS.

If either of the parents are syphilitic, the infant may inherit the disease. If the father is syphilitic, he may transmit the disease directly to the fœtus at the time of conception, and the mother may be infected through her offspring; or he may communicate it to the mother, and she may infect the child; or if the mother alone is syphilitic, the fœtus may become affected during intrauterine life, through the maternal blood.

When this happens, the fœtus is apt to die about the fourth month, and the mother miscarries. Repeated miscarriages at once suggest a syphilitic taint.

But the case may not be so bad as this. The child may be born alive, but thin and shrivelled, with a prematurely old expression, a hoarse voice, a snuffling breathing, a discharge from the nose, and an eruption about the anus and genitals.

Or, again, the child may be born apparently healthy, and the syphilitic symptoms may show themselves a month or six weeks afterwards.

Treatment.—The infant should be brought up by hand, that it may neither imbibe further poison from its mother, nor infect a hired nurse. Having secured this point, the surgeon should prescribe mercury, either in the form of small doses of grey powder, or as an inunction in the way recommended by Brodie. A drachm of blue ointment should be spread upon a roll of lint or flannel, and tied round the child's thigh or waist. The application should be renewed every morning until the symptoms have disappeared.

Though the commonest manifestations of infantile syphilis are of a superficial kind—snuffles, cutaneous eruptions, mucous tubercles, and the like—it sometimes happens that the liver, the brain, and other internal organs are affected by tumours which are due to the same cause. In these cases the child gradually wastes away, or else it is attacked by convulsions, and dies after a short illness.

When the surgeon is required to treat a case of infantile syphilis, he ought not to overlook the condition of the parents, for by persuading them to submit to timely treatment their future offspring may be more healthy. He should therefore put them upon a mild course of mercury, or prescribe iodide of potassium, or such other remedies as he may think fit, according to the state of their health, and the special symptoms that they present.

It is of the utmost importance, as Sir James Paget has pointed out, that students should learn, by wide observation and extensive practice, to recognise all the characters of syphilitic diseases so thoroughly as not to require the help of any statements from the patients themselves. For many patients are unwilling, and those that would be willing are often unable, to tell the truth in these cases. Women in the middle and higher ranks of society, when they have syphilis, are generally ignorant of the fact, and must be allowed to remain without even such a suspicion as would be suggested by their being asked about it. In such a case a question thoughtlessly put might disturb the peace of a family; and no benefit which the surgeon might hope to obtain from the information thus elicited could counterbalance the social mischief that it might occasion.

The surgeon is often asked how soon it is safe for a person who has had constitutional syphilis to contract marriage. Upon this point his answer should be given with caution, because it is doubtful if the syphilitic taint can ever be eradicated. If the patient falls into bad health or destitute circumstances, it may make its appearance after the lapse of many years during which it has lain dormant, and the patient has been apparently in excellent health. And, of course, if the disease is liable thus to revive, the patient's wife and offspring may become infected. It is therefore impossible to lay down positive rules, but, speaking generally, the patient should be advised to wait till the expiration of a year from the time when all secondary manifestations disappeared, and in the meanwhile to take a course of warm sulphur baths. If he can go to a warm climate, or take warm baths at some of the natural mineral springs—Harrogate, Bath, Spa, or Barèges, for example—that is the best measure to recommend. Formerly it was the custom to prescribe sudorifics, but the course I have indicated is safer, and will probably be also more agreeable to the patient.

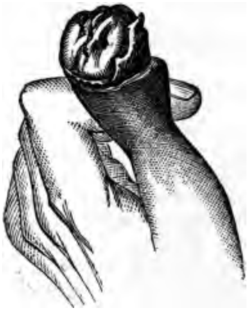
ONYCHIA.

Onychia is a disease of the matrix of the nail, attended by inflammation and ulceration of the adjacent parts. It occurs under two forms, the simple, and the malignant or specific.

Simple onychia begins as a circumscribed inflammation in the root of the nail. It is often excited by slight injuries—a prick, for example—in persons who are out of health.

The affected spot is red, hot, swollen and painful. Pus soon forms and makes its way to the surface. The nail becomes loose, shrivelled, and black; gradually it is thrown off and a new one grows in its place. The new one is often rough, and somewhat irregular in shape.

Fig. 121.



Onychia maligna.

Treatment.—The hand should be well supported in a sling, so as to be raised almost to the opposite shoulder. The inflammation must be met by poultices. If the pus is confined, it should be let out by a puncture. Care must be taken to protect the young nail; and of course everything should be done to regulate and improve the patient's general health.

Malignant onychia commences in the same way as the simple variety, but it runs on to ulceration, and this ulceration is usually of a most intractable kind. The inflamed spot has a dark, livid colour, and breaks down into an offensive sore. There is a discharge of sanious pus; after awhile large flabby granulations spring up, and the end of the finger, or toe, becomes much enlarged and clubbed. The nail turns black, shrivels, and breaks off in pieces; and any attempt which nature makes to form a new one is very imperfect. (Fig. 121.) This variety of the disease is often associated with a cachectic, strumous, or syphilitic state of the system.

Treatment.—Locally the first thing to be done is to remove the nail, which acts as a foreign body, and keeps up irritation. The ulcer must then be freely touched with lunar caustic, and dressed with stimulating applications. If there is a syphilitic history, a mercurial ointment or the black wash will be found useful.

Mr. MacCormac has lately drawn attention to the use of the powdered nitrate of lead, which has been employed with success by some continental surgeons as a local application.—(*Brit. Med. Jour.*, August 30, 1873.) It certainly deserves a further trial, for the disease is one which is very intractable under the ordinary treatment.

Constitutionally, we must endeavour to improve the patient's health by tonics, particularly cod-liver oil, and the preparations of iron and quinine (F. 41, 55, 56), by change of air, and a well regulated manner of life. If the case has a syphilitic origin, the iodide of potassium, or the preparations of mercury, in combination with tonics, will be most beneficial. (F. 50, 52, 43, 44.)

ULCERATION OF THE GREAT TOE.

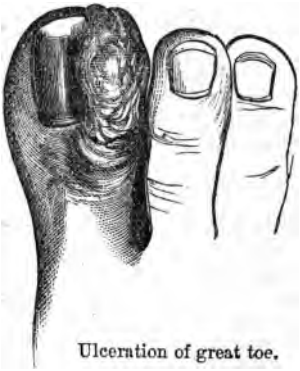
There is a painful affection of the great toe in which the nail is popularly said to "grow into the flesh." It is generally the consequence of wearing tight boots. The truth is, not that the nail grows into the flesh, but that it is pressed against the skin, thus keeping up a chronic irritation and inflammation. The tissues at the side of the nail become swollen and very tender, then ulceration takes place, and a sore is established, which discharges a thin, sanious pus. Large granulations spring up, which are exquisitely painful, and which overlap the nail, making it appear as if it grew into the flesh.

Treatment.—Tight boots, especially those which are narrow across the toes, must be laid aside altogether, and for a time the patient must wear only a loose slipper. The inflammation may be partially subdued by poultices or cold lotions, but to effect a radical cure more will be necessary. The simplest method of proceeding is to scrape down the nail until it is thin and pliable, touch the ulcerated surface with a fine pencil of lunar caustic, and then introduce cotton-wool, or a fold of lint soaked in glycerine, or in liquor potassæ, or in a solution of sulphate of copper.

Another method is to take a strip of very thin sheet-tin or of gutta-percha, fold it in the middle, and introduce this fold between the nail and the skin, and then to double one side back over the toes, and the other over the granulations.

If these or other similar methods are carefully carried out from day to day, much may be done to relieve the patient, and in some of the slighter cases a cure may be effected. But if the disease is severe, and of long standing, a portion of the nail may have to be removed. This is a time-honoured, but an excruciating operation, and the patient should either be anæsthetized, or the toe benumbed with ether spray. The sharp point of a pair of scissors should then be passed underneath the nail as far as the matrix, and the nail divided longitudinally. The slip thus separated must then be seized with a forceps, and drawn out by the root.

Fig. 122.



Ulceration of great toe.

A simpler and less painful operation is to cut off the whole of the granulations, together with a portion of the adjacent skin, by a single stroke of a scalpel. The case from which Fig. 122 was taken was treated in this way. The patient experienced immediate relief, and the wound healed favourably in a few days. When this last method is adopted, there is no chance of the disease recurring, for the contraction of the cicatrix tends to draw the skin away from the nail.

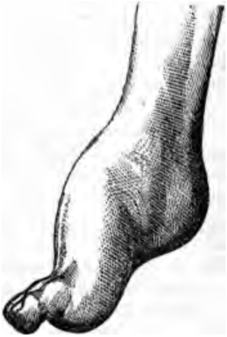
CONTRACTION OF THE FINGERS.

The fingers not unfrequently become contracted, and drawn down towards the palm. The little finger is generally the first affected in this way, the disease gradually extending to the others. The process of contraction is a very slow one, but the fingers become so fixed that no ordinary force can extend them.

The deformity seems to depend upon a chronic inflammation of the palmar fascia. Sometimes this appears to be excited by the constant and forcible use of the palm, as in handling certain tools. At other times it has a constitutional origin, and is connected with a rheumatic or gouty tendency.

The *treatment* consists in dividing the constrictions by means of subcutaneous incisions, and then extending the fingers upon a splint. If there is well marked gout in the system, even such a simple operation as this must be undertaken with caution.

Fig. 123.



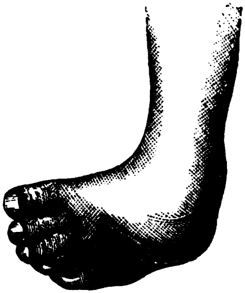
Talipes equinus.

CLUB-FOOT

(*Talipes*) is the name applied to a deformity which arises from contraction and rigidity of the muscles of the leg.

It occurs under four forms. Sometimes the heel is drawn up and the patient treads upon the ball of the foot and the toes (*talipes equinus*). This is the simplest, and also the most remediable, form of the disease. (Fig. 123.) Sometimes the foot is pointed upwards, and the weight of the body supported on the heel (*t. calcaneus*). This is a very rare affection. Sometimes the foot is twisted inwards, and the patient walks on the outer edge (*t. varus*). (Fig. 124.) Sometimes the foot is turned outwards, and the patient walks on the inner edge (*t. valgus*).

Fig. 124.



Talipes varus.

It frequently happens that these varieties are mixed. The equinus is often associated with the varus (*t. equino-varus*); or the calcaneus with the valgus (*t. calcaneo-valgus*).

Club-foot is generally congenital, but it may also come on in after life. When this happens, it is due either to—(1) Spasmodic irritation and contraction of the muscles; or (2) to paralysis of the *antagonistic* muscles; or (3) to the effects of local disease or injury.

The fault is generally in the muscles. The tendons, ligaments, and bones are only secondarily affected.

The *treatment* of course varies with the nature of the case. The first thing is to ascertain whether the affection is congenital or not; and if not, upon what cause it depends. If it is due to the irritation of worms, then a purge may suffice to remove it. If it arises from debility, then a course of tonics, particularly iron, with the regular use of galvanism, may be of service. If it is associated with a rheumatic tendency, the alkalies are likely to do good. (F. 46.) In any of these cases, friction, and the application of a light wooden or gutta-percha splint, will be found of great use, and should never be omitted.

If the deformity is so great that these milder measures are inadequate, the contracted tendons must be divided subcutaneously. A tenotomy knife is passed between the skin and the tendon that is to be operated on. The knife is introduced sideways, and the edge is turned down, and carried through the tendon. The knife is then withdrawn, and the incision closed with a piece of plaster. This operation may be repeated at the same time upon as many tendons as may require division. The cut ends become united by a tendinous structure, which not only adds directly to the length of the original tendon, but also admits of a good deal of extension while it is fresh.

In *t. equinus* the tendo Achillis must be divided. The section should be made about an inch above its insertion into the os calcis. In this case it is safest to pass the knife underneath the tendon, and cut from within outwards, for fear of wounding the posterior tibial artery.

In *t. calcaneus* the tibialis anticus, the long extensors of the toes, and the peronous tertius, may all require to be divided, before the foot can be brought down to its proper level.

In *t. varus* the foot is turned inwards in consequence of the contraction of the tibialis anticus and posticus. These are the tendons, therefore, which must be cut.

In *t. valgus* the foot is turned outward by the action of the peroneus longus and brevis. These, therefore, must be divided, and the most convenient place to get at them is where they lie behind the outer malleolus.

When the deformity is complicated, the surgeon must use his own judgment in deciding what tendons require division.

Under any circumstances, the patient will have to wear a splint, or a mechanical contrivance adapted to the case, for some time after the operation, in order to make gradual extension, and to reduce the foot to its proper position.

Mr. Barwell has recommended the use of elastic bands to supplement the paralysed muscles, and he has devised various ingenious methods of applying them to the patient's leg. He has been led to the practice by observing a peculiarly clumsy and imperfect use of the foot after division of certain tendons—a condition he has accounted for by the false and unsatisfactory union found in such cases as have been submitted to post-mortem examination. This observation refers especially to the tendons which lie immediately behind the malleoli. These, he believes, need never be divided. Moreover, he holds that the tendon of the tibialis anticus, as well as the tendo Achillis, require this operation much less often than is usually supposed. By manipulation, by elastic bands and by appropriate splints he finds that many cases may be effectually cured without the division of tendons. This treatment cannot be commenced too early. Indeed, it is only reasonable to suppose that these milder measures will have more effect upon the young and tender tissues of an infant than they can be expected to produce after the parts have become fixed in their abnormal position. The accompanying illustration (Fig. 125) represents a form of splint which Mr. Barwell finds very convenient for cases of talipes equinus after division of the tendo Achillis.

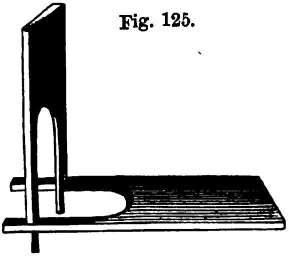


Fig. 125.

FLAT OR SPLAY FOOT.

Talipes valgus is often associated with the condition which i known as *flat or splay foot.* The ligaments which support the arch of the foot give way. The inner side of the sole almost touches the ground, and the foot has a tendency to turn outwards. There is constant aching *pain in the* ankle, and the patient walks awkwardly. This com-

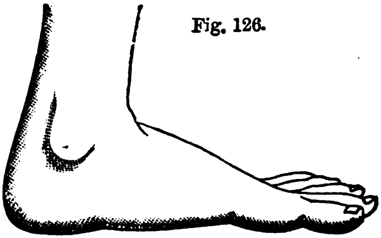


Fig. 126.

plaint is very common in a slight degree among young persons of both sexes whose occupations oblige them to stand or walk a great deal. Fig. 126 was taken from a middle-aged man, whose occupation was that of a waiter, and whose case may be considered as a typical example of the disease.

Treatment.—The patient should sponge the feet and ankles every morning with cold water, and wear a bandage brought up on the inside of the foot to support the arch. He should also have a convex pad adapted to the inside of his shoe so as to effect the same object. Such a pad may be made of cork, or of a cushion stuffed with horsehair; or a few layers of leather or folds of lint, carefully graduated, may serve the purpose sufficiently well. The pad should be worn constantly during the day, so that the arch of the foot may never be allowed to drop.

GENU-VALGUM, OR KNOCK-KNEE,

is an affection of early life. It almost always comes on between the age when children begin to walk and the time of puberty. It usually shows itself in one knee more than the other, but both are generally affected in some degree.

The legs yield under the weight of the body. The angle which naturally exists between the femur and the tibia is increased. The internal lateral ligament is stretched. The patella is thrown outwards. The external lateral ligament and the tendon of the biceps become contracted and tense. There is considerable weakness and constant aching pain.

Treatment.—The legs should be supported, and the knees drawn towards their proper position. If this is done perseveringly, while attention is paid to the patient's general health, a great improvement may be effected. To carry out these indications the surgeon should provide himself with a pair of straight wooden splints about three inches wide, and long enough to extend from the patient's waist to the outer ankle. They should be perforated with holes near their upper end, so as to fasten them to a waistband. They should be well padded, and then applied in the following manner:—The patient should be undressed from the waist, and laid flat upon a sofa. His legs should then be bandaged with a common calico roller from the toes to a short distance above the knees. Over this he should be allowed to put on his stockings and boots. The surgeon should then lay the splints along the outer side of each leg, taking care that they bear well against the external malleolus and the trochanter. In this position they should be fixed below by strips of plaster or bands of webbing and buckles, and the upper ends of both splints should be fastened to a broad belt passing round the waist, so as to prevent them from slipping forwards. Some surgeons recommend that they should be secured by a band passing from one to the other behind the waist, so that they may interfere less with the patient's movements. When the splints have been fixed the knee should be drawn outwards by a strap of webbing secured by a buckle or by a padded belt, which should be broad enough to cover the whole knee from the head of the tibia to the condyles of the femur. This must be kept sufficiently tight to make uniform traction upon the joint. In some instances it may be desirable to apply a second bandage up the whole length of the leg, so as to draw it towards the splint. The apparatus should be taken off at night after the patient is in bed, and readjusted in the morning before he gets up. Unless the splints are applied with care and attention, and worn continuously for several months, they will be of little or no avail.

When the patient is a young child, he may with advantage be kept in bed during a great part of the day, with his legs fixed between sandbags or extended by weights.

CORNS.

Corns consist of thickened and hypertrophied cuticle, beneath which the papillæ are enlarged and tender. When they are situated on an exposed part of the surface they are dry and hard, but when they occur between the toes, where the perspiration is retained, they are soft and moist. They are usually caused by the pressure of tight boots, and their most frequent seat is over the prominences of bone—*e.g.*, on the outer side of the little toe. When they are struck, or trodden upon, they become exquisitely painful; in fact, their extreme sensitiveness has passed into a proverb. When they become acutely inflamed, the suffering they cause is equally great and more persistent.

Treatment.—The first thing to be done is to remove the cause. The patient should wear boots that are properly shaped, and amply broad across the toes. A piece of thick plaster, or amadou, with a hole punched in it large enough to receive the whole corn, may be laid over it to relieve it from pressure. With the view of curing the corn, the hardened cuticle should be shaved off, or filed down daily, and the part afterwards kept soft by the application of a little cold cream, glycerine, or soap; or it may be covered with a small piece of galbanum plaster or of "Papier Fayard." Care must be taken in cutting them not to make them bleed—an accident which is very apt to happen in consequence of the overgrowth of *the papillæ. If* this should occur, and any difficulty is found in arresting the hæmorrhage, the application of a little blotting-paper or charred paper will suffice to stop it, if a bandage is not at hand. If the corn is inflamed, it should be soaked in hot water and poulticed. A poultice made with vinegar often gives great relief. If there is reason to think that suppuration has taken place, a puncture should be made with the point of a scalpel. Soft corns are best treated by the free application of lunar caustic or acetic acid. In elderly people these agents must be used with caution, for fear of inducing gangrenous inflammation.

BUNIONS.

Bunion is the name given to a swelling formed by a chronic inflammatory enlargement of the bursa which is situated on the inner side of the head of the first metatarsal bone. It is at times exquisitely painful, and, if it becomes acutely inflamed and suppurates, a thin, unhealthy discharge is apt to continue for a length of time. It is generally caused by the pressure of boots that are too short as well as too narrow across the toes; and in most instances the great toe is distorted, and pressed against the other toes.

The pathology and treatment of the disease are much the same as those of "housemaid's knee" (see p. 104).

Treatment.—The patient must be careful to wear boots that are made of soft and pliable material, and which are thoroughly easy. If the great toe is distorted, it may be drawn into its place by means of a steel spring; or by pads of lint or cotton-wool between the toes, kept in place by a strip of adhesive plaster. If the bunion is in an indolent and chronic state, iodine tincture, or a mercurial ointment, or a blister will be found suitable applications. If it becomes acutely inflamed, it must be poulticed or leeched. If matter forms, it should be let out, and care taken to make the sac heal from the bottom. In any case the patient should give himself as much rest as he can until the bunion is cured, or at least brought into a quiescent state; for it is sure to be aggravated by exercise.

PART V.

OPERATIONS.

An operation is a serious matter, and ought never to be recommended without due consideration. The most trivial operations have occasionally been followed by death, and the possibility of such a contingency ought always to be present to the surgeon's mind. He should, therefore, try to convey to the patient, or his friends, a fair idea of the risk to be incurred, whether it be great or small. And in order to form a correct estimate of the danger there are many circumstances which must be taken into account—*e.g.*, the nature and extent of the disease, the age and sex of the patient, his natural constitution and temperament, his business and habits of life, the conditions in which he will be placed when he is confined to bed, and the nursing he will be able to obtain. All these are points of great importance, for it makes a wide difference whether he is young or old, of a sound constitution or affected with organic disease, of a calm and placid temperament or irritable and excitable, whether he is in tolerable general health or worn down by protracted suffering. The surgeon must be on his guard, and not mistake high spirits and courage for real strength and rallying power. Again, it makes a great difference whether the patient's time is at his own disposal, or whether he is anxious about the means of earning his livelihood. Whether the operation is to be performed in town or in the country, and whether or not skilful nursing can be obtained, should also be taken into consideration. There are many cases in which one of the most important duties of the surgeon is to arrange for the nursing—more particularly during the night. Happily this is not now a very difficult matter, as, in addition to the numerous private institutions, there are so many training schools for nurses in connexion with the hospitals.

When an operation is necessary, the patient should, if possible, *be prepared for it.* He should be kept quiet for a few days, the secretions regulated, and, if need be, the strength supported by the administration of tonics or stimulants. It is of the utmost importance that every function of the body should be in its normal state, and that the mind should be calm and hopeful. Of course, there are many operations which must be performed without delay, and where there is no time for preparing the patient—for example, the operation for strangulated hernia, or an amputation after injury.

Again, there are many cases where other considerations must be taken into account. The patient's time may be limited—*e.g.*, he may be under orders for foreign service—and then we must be contented to do the best that can be done under the circumstances.

The surgeon should himself see that everything is ready for the operation—that the table, or couch, is firm, of a convenient height, and well situated for light—that there is a sufficient supply of sponges and water—that every instrument, which can possibly be required, is at hand, and within easy reach—that the necessary splints, dressings, and bandages are in readiness. He should have a sufficient number of assistants, but no more; and each should understand beforehand what are his special duties. In the case of a capital operation, three or four will be necessary. If chloroform is to be used, its administration must be entrusted to a competent person, and he should make it his sole business, so that the operator may have no anxiety on that score. The surgeon should take his stand in the most convenient position, and from that place he should not move till the operation is completed. There should be perfect silence during its performance; and a word, a look, a gesture, is all that should be necessary on the part of the surgeon, to guide the movements of his assistants. Everything should be done quietly and deliberately, but without hurry or loss of time.

INCISIONS.

The scalpel may be held like a carving knife, or like a pen, or like a fiddlestick, or in other ways which the requirements of the case and the dexterity of the surgeon will suggest.

Before commencing an incision, the skin should be gently stretched with the left hand. The point of the scalpel should be introduced at right angles to the surface, and carried quite through the skin; the handle should then be depressed, and the blade drawn along as far as necessary; the handle again raised, and the knife withdrawn at right angles to the surface, as before. Sometimes, the superficial incision is made by transfixion. A fold of skin is raised between the forefinger and thumb of the left hand, pierced, and then the blade is made to cut from within outwards. In any case, a sufficient incision in the skin should be made at the outset. It should not be needful, except under special circumstances, to enlarge it afterwards.

ANÆSTHETICS.

The history of anæsthetics is a subject full of interest, but it is one on which I cannot here enter. Suffice it to say, that the introduction of ether in 1846 is due to Mr. Morton, a dentist of Boston, U.S.A.; while it was Sir James Simpson who drew the attention of the profession in 1847 to chloroform—an anæsthetic which is more convenient than ether, and which is now very generally used in this country.

Administration of chloroform.—The patient should, if possible, abstain from food for three or four hours before the chloroform is to be given, or take only a little beef-tea or wine. When the stomach is full, sickness is very apt to occur. He should be placed in the recumbent position, lying on his back, and arranged as if for sleep. The administrator should keep his hand on the pulse, watch the breathing and the colour of the lips, and from time to time examine the state of the pupils.

When a slight and transient insensibility is all that is wanted, chloroform may be given on a handkerchief, or on a fold of lint; and this will always be found the best plan in dealing with infants. But when deep and prolonged narcotism is necessary in the adult, an inhaler had better be used.

At first, a small quantity of chloroform—say, ʒj for an adult—should be sprinkled on the lint, and it should be held in front of the patient's nose and mouth, at the distance of a couple of inches. After a few respirations, it should be brought a little nearer, and thus the dose should be gradually increased; but the saturated lint should never be placed so near the face as to prevent the free admixture of atmospheric air with the vapour of the chloroform. If an inhaler is used, the valve should be kept open at first, and closed by degrees. It is of great importance that the dose should be small at first, and gradually increased, so that the air-passages may become accustomed to the vapour. Moreover, there is reason to think that the first inhalation of a large dose of chloroform has sometimes caused instant death by spasm of the glottis, or paralysis of the heart.

If a fold of lint or an ordinary inhaler is used, the amount of chloroform vapour which the patient breathes must be very uncertain—sometimes it will be more and sometimes less, and very probably *it will be* greatest at first, when it is desirable [illegible] should be least. To obviate these disadvantages, Mr. Clover has invented an apparatus whereby the percentage of chloroform to atmospheric air can be regulated exactly. A measured quantity of chloroform and a measured quantity of atmospheric air are introduced into a large air-tight bag, which is fitted with a flexible tube and a mouthpiece. Thus the dilution of the chloroform vapour can be ascertained with great nicety, and under no circumstances can the patient breathe a larger proportion of the anæsthetic than that which has been predetermined by the surgeon. The apparatus is, unfortunately, rather cumbrous; but, notwithstanding this drawback, it is by far the best means of administering chloroform that has yet been devised; and nothing can be more satisfactory than the success which has attended its use in Mr. Clover's hands.

The first effect of chloroform is to produce a slight excitement. The pulse is quickened; the spirits are raised; and the mind is active, but not quite under control. The patient struggles, talks loudly and incoherently, or perhaps sings; still there is perfect sensibility to pain. Gradually, these symptoms give way, and he falls into a deep sleep. The breathing is slightly stertorous. Voluntary motion and sensation are suspended, but the sphincters are not relaxed. Soon, reflex movements can no longer be excited; if the eyeball is touched, or the nostril tickled, no attempt is made to resent the irritation. This is the state of complete insensibility in which the patient should be placed when the operation is commenced. If the chloroform is pushed farther than this, the breathing becomes slow, and very stertorous, the face congested, the pupils dilated, and there is a tendency to death by coma.

Thus, it will be seen that chloroform acts upon the brain from its circumference to its centre. First, the intellectual faculties are disturbed; then, the central ganglia of motion and sensation, with which the spinal cord is in communication, become affected; and, when the influence of the drug extends to the medulla oblongata, respiration is apt to cease. When chloroform destroys life in this way, it acts like a poisonous dose of opium, or of alcohol. In such cases, the heart continues to beat for a few minutes after the action of the lungs has stopped.

If the patient retches, and is inclined to vomit, his head should be turned on one side, so as to facilitate the escape of matters from his mouth.

If he struggles violently, the chloroform should be removed for a moment; and, as soon as he is composed, the administration should be continued.

As long as the pulse is good, and the breathing regular, there is no cause for alarm. When the chloroform has been pushed to excess, there is, as we have just said, danger of death by coma; but this is not the only way in which it extinguishes life. Sometimes it seems to act by paralysing the heart. This is particularly apt to occur when the cavities are dilated, and the muscular tissue is thin, and in a state of fatty degeneration. When it proves fatal in this way, death may occur at the first inspiration, or at any time during the administration.

If the patient is old or debilitated—if the impulse of the heart is feeble, the sounds indistinct, the pulse weak; or if there is a well-marked arcus senilis; or if the circulation through the lungs is impeded—the utmost care should be used in administering chloroform. It should also be remembered that in some cases the patient receives an additional shock from the nature of the operation, as when the spermatic cord is divided.

There are some operations which it is better to perform without chloroform. Speaking generally, these may be summed up under two heads: (1) operations about the back of the mouth—excision of the tonsils, for example—where there is danger of the blood finding its way into the glottis, and producing suffocation; and (2) operations in which we require the assistance of the patient—for example, in the ligature of internal piles.

As a general rule, chloroform should not be given, when a minute's fortitude on the part of the patient will enable him to endure all that has to be done. The occasion does not justify the risk.

If death seems imminent, whether it be by syncope or by coma, restorative measures should be adopted without delay. The windows should be opened, the patient's tongue drawn forward, the face and chest dashed with cold water, ammonia held to the nostrils, the chest rhythmically compressed, artificial respiration performed, and galvanism applied over the heart.

Ether has always been a favourite anæsthetic in America, but in this country, notwithstanding that it has been frequently tried, it has never come into general use. There can be no doubt that it is, on the whole, safer than chloroform; but its administration takes a longer time, is apt to be attended by more excitement, and followed by more unpleasant after-symptoms.

The *Bichloride of Methylene* is another substance which has lately been much used by some surgeons as an anæsthetic. The advantages which it is said to possess over chloroform are that it produces insensibility more rapidly, that there is less muscular rigidity, that recovery takes place more quickly, and that it is less liable to be followed by disagreeable consequences.

The *nitrous oxide*, or laughing gas, has been introduced into practice by the American surgeons, and has now taken its place as a recognised anæsthetic. As the insensibility it produces cannot safely be prolonged beyond a few minutes, it is not suitable for general surgery; but for short operations, such as the majority of those in dentistry, it is a very valuable agent.

Local Anæsthesia.—Local and superficial insensibility may be produced by using a mixture of pounded ice and salt—two-thirds of ice and one-third of salt. The mixture should be made rapidly, placed in a muslin bag, and laid upon the part. In five or ten minutes the skin becomes white, hard, and insensible to pain. After the operation, it should be allowed to recover itself slowly. Heat should on no account be applied.

But this means of producing local insensibility has been well-nigh superseded by Dr. Richardson's method, which consists in throwing a spray of highly rectified ether upon the part. By the rapid evaporation which the ether undergoes the skin is frozen, and rendered insensible to pain. Richardson's apparatus is simple, and can be obtained at any surgical instrument maker's.

Local anæsthesia, however, is only applicable to slight operations—opening abscesses, removing small tumours, and the like.

DRESSINGS.

A vast improvement has taken place of late years in the mode of dressing wounds. The present practice is characterized by great simplicity, and by a studious regard to cleanliness.

I have already said that the aim of modern surgery is to reduce suppuration to a minimum, and, wherever it is possible, to get rid of it altogether. With this view various applications have been used, and various methods of dressing have been tried. Of these applications the most efficient is carbolic acid, and the most effectual way of applying it is that which is carried out by Mr. Lister, and which I have elsewhere briefly described. (See p. 13.) But where carbolic acid (F. 9) or sulphurous acid (F. 11) or chloride of zinc (F. 24) or any other substance is used, it is of the first importance that it should be brought thoroughly and continuously into contact with the wound. The plan which Mr. Lister adopts secures this object perfectly. The only fault that can be found with it is that it is too complicated—that it requires too much time and attention from the surgeon. If it could be made more simple, I believe it would be one of the most far-reaching improvements in modern surgery. At Charing-Cross Hospital Mr. Hancock has had some excellent results after important operations by merely washing out the wound thoroughly with a carbolized lotion, covering it with lint, and allowing a weak carbolic lotion to drop constantly upon it from a syphon bottle.

Some surgeons prefer to get rid of all moist applications, and to use only dry dressings. Thus a wound may be carefully washed out, accurately stitched together, and then the edges sealed with collodion, Friar's balsam, or "colloid styptic." This method is best suited to wounds of moderate size in parts that are highly vascular, such as the face or scalp. In larger wounds, after careful closure, a pad of "tenax" (*i.e.*, finely carded oakum) or of dry lint may be laid over the whole surface, and firmly secured by a bandage. This method is very suitable to the wound left after the removal of a tumour—*e.g.*, of the breast. When such dressings as these are employed, it is no uncommon thing to find that the whole, or a great part, of a wound unites by adhesive inflammation. But these methods of dressing are only applicable to cases in which we may reasonably expect that there will be no sloughing—that no considerable part of the tissues will have to be thrown off before repair can begin, but that all within the incision will retain its vitality and become united together.

If the case is not suitable for dry dressings, and if the surgeon does not think proper to adopt any antiseptic method, then it is customary to cover the wound with a few folds of wet lint covered with oiled silk (water-dressing), and to secure them by means of a bandage. Sometimes narrow strips of lint, spread with simple cerate, are laid along the incisions, to prevent the folds of lint from becoming adherent. These dressings are not disturbed for a couple of days, except under special circumstances. Subsequently, the wound is treated, if need be, with a suitable lotion, or a poultice.

When suppuration takes place, if it is moderate in amount and healthy in character, all that need be done is to receive the discharge on lint, which should be frequently changed.

If the neighbourhood of the wound becomes red, swollen, and painful, if there are the signs of inflammation, then we must apply a poultice or a bladder of ice; whichever is found to give the patient most relief will be best for the wound.

Cold seems to act by constricting the vessels, so as to diminish the quantity of blood in the part, and by absorbing the heat that is generated; while, at the same time, it relieves pain by deadening the sensibility of the nerves. Continuous cold can only be thoroughly maintained by a bladder of ice, by an ice poultice (F. 83), or by irrigation—that is to say, by causing iced water, or evaporating lotion, to drop constantly on the affected part, or on a fold of lint laid over it.

Heat combined with moisture relaxes the tissues, dilates the vessels, favours exudation, and allows the circulation to be carried on more easily. This is one of the special uses of a poultice—it allays inflammation by relieving the circulation. Fomentations—that is to say, flannels wrung out of hot water, plain or medicated, and enveloped in oiled calico—and water-dressing, act in the same way, but less efficiently.

There are, however, other conditions, in which heat and moisture are extremely useful. When a part is lacerated or contused, when it is clear that sloughs must come away before reparation can begin, then a poultice is applied with advantage. It would seem that the natural processes go on with greater rapidity in the warm and moist atmosphere, which is kept up by this means. The disintegration of the dead tissues takes place more quickly, the sloughs separate in a shorter time; and, when once a clean surface has been produced, the granulations spring up with a more luxuriant growth.

If poultices are continued too long, the granulations are apt to become large, pale, and flabby—constituting what is popularly called "proud flesh"—and the surrounding tissues are sodden. In such a case the poultices should be discontinued, and the wound dressed with a stimulating lotion. Sometimes great benefit may arise from exposing it for a few hours to the air. If the granulations are exuberant, they should be freely touched with lunar caustic.

If the suppuration is excessive, the wound should be bathed or syringed with an astringent lotion, or dressed with lint dipped in it. (F. 9, 11, 24.)

If the discharge is very offensive, lint saturated with a disinfecting lotion should be applied to the wound, and a poultice laid over it; or the poultice may be mixed with charcoal or yeast.

In those distressing cases in which the patient's urine is constantly dribbling away, it is a good plan to lay a pillow of charcoal between the thighs and under the perineum.

CONSTITUTIONAL TREATMENT AFTER OPERATIONS.

After a trifling operation it is not necessary to make any change in the patient's way of living, provided that proper attention is paid to the state of the bowels.

After a second-rate operation the patient should be confined to bed for a few days, the diet should be somewhat restricted, and a laxative prescribed every evening.

After a capital operation, where there is sure to be more or less fever, the patient should take an effervescing saline (F. 31), his bowels should be freely opened every day, and his diet should consist of beef-tea, broth, eggs, light puddings, &c. In most cases some stimulant will be required. This is particularly the case when the patient is old, or enfeebled by previous disease, or when he has been prostrated by the shock of the operation, or by hæmorrhage. As a general rule, brandy or port wine are the best stimulants; but it is often the wisest plan to give the patient whatever he has been accustomed to drink, or whatever he fancies at the time. Egg-flip is of great use in extreme exhaustion (F. 86); and, at the same time, ammonia and spirits of chloroform may be freely given. (F. 31.)

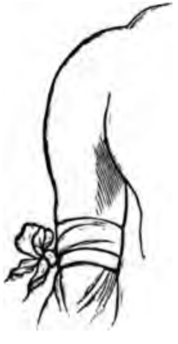
Some surgeons make a practice of ordering a grain of opium or a sedative draught to be taken every six hours after a capital operation, with the view of allaying nervous irritability; and the practice is one which may often be followed with advantage, especially in persons of an excitable temperament. Under any circumstances, it is a good plan to give a full dose of opium or morphia the night after a severe operation, to allay pain and procure sleep.

VENESECTION.

Fifty years ago venesection used to be much more often practised than it is at the present time. Persons now living can remember when those in good health thought it necessary to be bled every spring, or every spring and autumn. Bleeding entered largely into the regimen to which pregnant women were subjected; and there is reason to fear that many, like the Princess Charlotte, succumbed to its lowering influence (see the Memoirs of Baron Stockmar, i. 65). In the treatment of disease the lancet was freely used, and the amount of blood that was sometimes drawn is almost incredible. Insanity, in all its forms, was supposed to depend upon inflammation of the brain, and was to be cured by blood-letting; while many morbid states which we now know to be far removed from sthenic inflammation, were treated in the same manner.

But all this—so far, at least, as British medicine and surgery are concerned—is now happily changed. It is now held in the most literal sense that "the blood is the life," and it is our study to maintain its quantity, to preserve its purity, and to regulate its distribution. There should, therefore, be

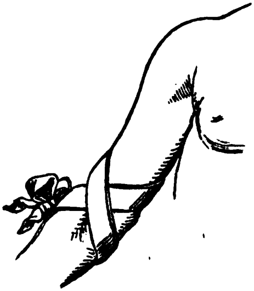
Fig. 127.



Bandage before venesection.

very clear evidence to act upon, and some very special benefit to obtain, before general blood-letting is resorted to.

Fig. 128.



Bandage after venesection.

Venesection is generally performed at the bend of the elbow. A broad roller is tied round the arm a little above the elbow, tight enough to compress the superficial veins, without arresting the deep circulation. (Fig. 127.) The surgeon then selects the vein to be opened—the median cephalic or the median basilic, the former, if possible—places his thumb on the lower part of it, and pushes his lancet obliquely through it, so as to lay it open without dividing it. When the required quantity of blood has been drawn, he puts a small compress of lint on the bleeding point, fixes it with a strip of plaster and a figure-of-8 bandage (Fig. 128), and then undoes the roller.

If the jugular vein has to be opened, the incision should be carried obliquely downwards and inwards, so as to cross the fibres of the platysma.

THE CAUTERY, ISSUES, SETONS.

Counter-irritation is sometimes made by means of the actual cautery, or by issues, or by setons.

If the *actual cautery* is used, the iron, heated to a dull red heat, is drawn lightly over the skin, sometimes in parallel lines and cross-bars, like an heraldic portcullis.

The *moxa* is a peculiar method of applying cauterization. A small cone is formed of muslin soaked in solution of nitre. It is then placed on the skin, and the apex is ignited. It is allowed to burn slowly down, and the result is an eschar, corresponding in size to the base of the cone. The surrounding skin should be protected by a fold of wet lint, with a hole cut in it.

Counter-irritation by means of the actual cautery, or the moxa, is particularly applicable to deep-seated and chronic disease of joints and bones.

Issues may be made either with caustic or by incision.

If caustic is preferred, the best is a thick paste composed of potassa fusa and bread-crumbs, or soft soap. A piece of leather plaster, with a hole cut in it the size of the desired issue, should be laid on the part, the paste applied to the skin which is visible at the aperture, and retained by a strip of plaster. For about a couple of hours the patient experiences a burning pain. An eschar is formed, which must be poulticed till it separates, and then the raw surface should be dressed with savine ointment.

If the issue is to be made by incision, a fold of skin is raised between the finger and thumb of the left hand, transfixed, and the knife made to cut its way from within outwards. To increase the effect, a string of issue-beads or dried peas is sometimes laid along the incision, and secured by strips of plaster.

An issue should never be made directly over a projecting process of bone. In all cases the wound ought to be confined to the skin; if it extends farther, it may lead to a troublesome sore. When the raw surface ceases to discharge healthily, the sooner it is healed the better.

A *seton* is made by lifting up a fold of skin between the finger and thumb, and piercing it with a narrow-bladed knife. The grooved knife represented in Fig. 129 is very suitable for the purpose. An eyed probe, armed with two or three threads of silk, is then passed through the wound, or along the groove of the knife, and the ends tied together. Or, in minor cases, a large needle doubly threaded with stout silk may be passed through a fold of skin, and the ends tied as before. The loop thus formed should be moved a little every day to keep up irritation.

Fig. 129.

LARYNGOTOMY AND TRACHEOTOMY.

It is often necessary to make an opening into the windpipe when the larynx is obstructed, or when there is a foreign body in the bronchi.

The obstruction of the larynx may arise either from acute or chronic disease, or from the impaction of a foreign body.

The acute diseases most likely to require operative treatment are œdema glottidis, erysipelas of the larynx, croup, and, in the adult, acute laryngitis.

The chronic diseases are chronic inflammation of the larynx with thickening or ulceration; morbid growths, either in the larynx itself, or pressing upon it from without.

When a foreign body, such as a morsel of food, has become impacted in the larynx, it is necessary to open the windpipe at once, to prevent suffocation; and when a foreign body has found its way into the bronchi, an artificial opening may be needful to facilitate its expulsion.

When an operation has become necessary the question arises, where shall the windpipe be opened? The surgeon has a choice of situations. He may perform *laryngotomy*, *laryngo-tracheotomy*, or *tracheotomy*.

Laryngotomy consists in cutting vertically through the skin and fascia, exposing the crico-thyroid membrane, and then dividing it by a transverse incision. The crico-thyroid membrane may easily be recognised by the depression which it forms about an inch below the *pomum Adami*. This operation is only applicable to adults.

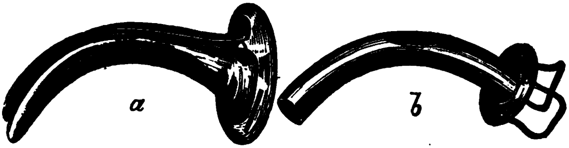
In *laryngo-tracheotomy* the deep incision is carried downwards from the crico-thyroid membrane, through the cricoid cartilage and one or two of the upper rings of the trachea.

Tracheotomy is a more difficult and dangerous operation than either of the preceding. It may be performed either above or below the isthmus of the thyroid gland. The patient's head should be thrown back, so as to stretch the neck. An incision, about an inch and a half long, should then be made through the skin and superficial fascia. The dissection should be carried on, partly with the point of the knife and partly with the handle, between the sterno-hyoid and sterno-thyroid muscles of each side, until the rings of the trachea are exposed. As far as possible the larger veins should be avoided; if any are divided, they should be tied at once. The capillary hæmorrhage should be restrained by gentle pressure, or by cold water, before the windpipe is opened. When the bleeding has ceased, the surgeon steadies the trachea with a hook or with his finger, and then pushes the point of his scalpel through it, and cuts *from below upwards*, dividing three or four of the rings. The knife should be lightly held in the wound, so as to form a guide upon which the tube can be slipped into the trachea. If this is not done—if the surgeon once withdraws his knife—he may find it very difficult to introduce the tube. The grooved knife represented in Fig. 129 is well suited to form a guide into the windpipe.

The isthmus of the thyroid gland should be pushed upwards or downwards, according to the seat of the operation.

Tracheotomy below the isthmus is a more formidable operation than when the opening is made above that point. In this situation the trachea lies deeper, it is more covered, and it comes into close relation with some very important parts. Superficially, it is covered by the inferior thyroid plexus of veins. The innominate artery lies just behind the upper border of the sternum, and may even rise higher; and there may be a "thyroidea ima" coursing up the front of the trachea itself.

Fig. 130.



Outer and inner tracheotomy tubes.

The best tubes are those which are double—the inner one (Fig. 130, *b*) fitting accurately into, and projecting a little beyond, the outer one (Fig. 130, *a*). If one of these is used, the inner tube can be withdrawn from time to time, and cleaned. When the outer tube is split up the middle, and reduced to two lateral pieces, which can be pressed together at the point so as to form a wedge, it very much facilitates its introduction.

The tube should be secured by tapes passed round the neck, and tied behind. The edges of the wound should be protected against the pressure and irritation of the tube by a little cotton-wool, or a piece of lint spread with simple cerate.

The great danger after the operation, more especially in children, is extension of inflammation to the lungs—bronchitis or pneumonia. To prevent this must be our chief aim. The throat should be lightly covered with flannel. The patient should breathe a warm, moist atmosphere. The curtains of his bed should be drawn, and a kettle, or cans of hot water, giving off steam, should be placed near him, so as to create a sort of vapour bath. At the same time, his strength will probably require to be upheld by a liberal allowance of strong beef-tea and soup. In many cases stimulants will also be needed.

If the operation has been performed for a temporary cause, the tube should be removed as soon as possible, and the wound allowed to heal. But in cases of permanent obstruction, it will be necessary for the patient to wear a tube during the remainder of his life.

Laryngotomy and laryngo-tracheotomy, are, as I have implied, safer and easier operations than tracheotomy. They can, moreover, be performed in a shorter time; and they are generally sufficient to meet the requirements of all ordinary cases, for inflammatory action commonly stops at the vocal cords.

Tracheotomy is especially applicable to those cases in which a foreign body is lodged in the bronchi, and where we must make a large opening to facilitate its expulsion; and also to cases of croup, in which we want to get as far away from the larynx as possible, in the hope of reaching a point to which the inflammation does not extend.

It is one of the vexed questions of surgery, whether the windpipe ought, or ought not, to be opened in cases of croup. The operation is so far from being successful that few surgeons would venture to recommend it, except as a last resource. And even as a last resource, it ought not to be practised in all cases indiscriminately. If the face has a peach-coloured hue, and the pulse is quick, weak, and failing, then an operation ought not to be undertaken. But if the colour is good, if the blood is still well aërated, and the pulse full, strong, and regular, while at the same time it is clear that the disease is making progress, and will ere long destroy life, then tracheotomy may be proposed with some slight hope of success.

LIGATURE OF ARTERIES.

Ligature of the lingual artery has been practised both for persistent bleeding from an ulcerated cancer of the tongue, and also in the hope of starving tumours in that situation. I believe the cases are rare in which it is impossible to arrest hæmorrhage from the tongue at the bleeding point; and, although cutting of the supply of blood from a morbid growth may have some temporary effect on its nutrition, yet it is of no permanent benefit. It must also be borne in mind that it has generally been in cases of malignant disease of the tongue that ligature of the lingual artery has been recommended, and in such cases the normal anatomy of the parts is liable to be disturbed by the enlargement which takes place in the submental region and at the upper part of the neck. For these reasons, therefore, the operation is one which, as a general rule, cannot be recommended.

If, however, the surgeon deems it necessary to tie the artery, it may be reached most conveniently near its origin, where it lies just above the greater cornu of the hyoid bone, and before it passes beneath the hyo-glossus muscle. An incision should be made, almost from the point of the chin, downwards and backwards, to a little below the greater horn of the hyoid bone. This incision should then be turned and carried upwards, almost at a right angle, to near the angle of the jaw. The flap, when dissected back, will correspond nearly with the digastric triangle. The posterior border of the submaxillary gland will have to be held aside. This will bring into view the central tendon of the digastric, and the posterior edge of the mylo-hyoid muscle; and the hypo-glossal nerve with a vein will be seen lying horizontally upon the hyo-glossus muscle. If then the surgeon feels for the posterior margin of this muscle, he will find the lingual artery lying just above the greater cornu of the hyoid bone. Perhaps he may have to divide a portion of the muscle before he will be able to place the ligature.

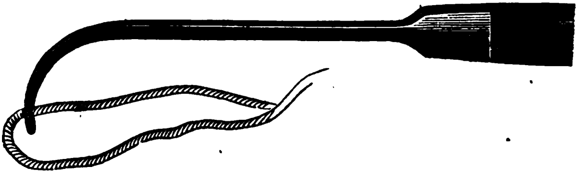
Ligature of the common carotid artery may be required for a wound, or for an aneurism, either of the vessel itself or of one of its branches. If the trunk itself is wounded, a ligature must be put upon both ends of the vessel, at the seat of injury.

If the surgeon can select his own situation, he generally places the ligature either immediately above, or immediately below, the crossing of the omo-hyoid muscle.

The anterior border of the sterno-mastoid muscle, or a line drawn from the sterno-clavicular joint to the depression behind the angle of the jaw, serves as a guide to the course of the artery. Here it lies upon the anterior spinal muscles, having the sympathetic nerve behind it, and the descendens noni in front. On its outer side is the internal jugular vein, and between the vein and the artery, and behind them both, is placed the pneumogastric nerve. The vein, artery, and nerve are all included in a common sheath, though each has its own compartment. Occasionally, the descendens noni is found in the same sheath, lying in front of the artery.

An incision is made about three inches long, commencing opposite the upper border of the thyroid cartilage, and carried along the anterior edge of the sterno-mastoid muscle. After cutting through the skin, platysma, and superficial fascia, the sheath of the vessels comes into view. This must be carefully exposed with the finger-nail or the handle of the scalpel, and freed from the branches of the descendens noni. The sheath should then be lifted with a forceps at the point where the liga-

Fig. 131.



ture is to be applied, and a nick made in it—the flat of the blade being turned towards the artery. The opening in the sheath should then be enlarged on a director. If the vein overlaps the artery, as it sometimes does, it must be held back with a retractor. The pneumogastric nerve will probably be drawn aside along with it. An aneurism needle (Fig. 131), armed with a stout ligature, should then be passed cautiously and closely round the artery from without inwards. Sometimes it is safer and more convenient to pass the needle unarmed, and then to thread it, and withdraw it. In this, and in every operation of the same kind, the parts should be disturbed as little as possible. Before the ligature is tied, it is well to see that it embraces nothing but the artery, and that pressure upon the included vessel arrests the hæmorrhage, or controls the pulsation in the aneurism, as the case may be. The ligature should be drawn tight, so as to divide the two inner coats of the artery, and then be tied in a reef-knot. One end should be cut off, and the other left hanging out of the wound. When bleeding has quite ceased, the edges of the wound should be brought together, and secured by strips of plaster. The patient must be kept perfectly quiet, until the ligature comes away. This will probably happen in the course of ten or twelve days. Or the surgeon may prefer to use a carbolized catgut ligature, and to cut both ends off short, and to endeavour to heal the wound as rapidly as possible by adhesive inflammation.

The pulsation in an aneurism, which has ceased as soon as the ligature was applied, sometimes returns when the collateral circulation becomes established, and then again gradually disappears as consolidation takes place in the sac.

Aneurism of the innominate artery has been treated by the ligature of the subclavian and carotid arteries, either simultaneously, or with an interval of time. But the success which has attended these operations is not such as to encourage surgeons to repeat them. It must, I think, be allowed that, as far as our experience has yet gone, the treatment of this formidable disease belongs to the physician rather than to the surgeon. More can be done by medicine and diet, to prolong the patient's life, and to make it tolerable, than by operative surgery.

Ligature of the subclavian artery has been performed in all the three parts of its course, though the results which have attended these operations upon the first and second portions have scarcely been such as to warrant their repetition.

Ligature of the subclavian artery in the first part of its course upon the left side is an impracticable operation, on account of the depth at which the vessel lies, and the important parts by which it is surrounded. On the right side the operation is practicable, but it has never been performed with success. Looking at the difficulty of its execution, Sir Wm. Fergusson says—"Were I asked to state which I thought the most difficult operation in surgery, I should at once name the one last described" (*i.e.*, ligature of the subclavian artery on the tracheal side of the scaleni muscles). While Mr. Erichsen, having regard to the principle upon which it is based, and the results attained by it, says—"While this operation is bad in principle, it is most unfortunate in practice." It is not necessary, therefore, that I should describe the mode of its performance, for it is a proceeding which cannot be recommended. The distinguished surgeon whom I have just quoted, says that in his opinion it ought certainly "to be banished from surgical practice."

Ligature of the subclavian artery in the second part of its course, where it lies between the scaleni muscles, has been practised, and with success, by no less distinguished a surgeon than Dupuytren. Still it is not looked upon with favour at the present day; and when we consider that the scalenus anticus has to be divided, upon which lies the phrenic nerve, and at the inner margin of which is the internal jugular vein, and that many other most important parts are situated in the immediate neighbourhood, we shall not be surprised that Dupuytren's example has been but seldom followed.

Ligature of the subclavian artery in the third part of its course is the only operation upon this vessel which can be recommended. In performing this operation the shoulders should be lowered as much as possible. The skin should then be evenly drawn down, and an incision made upon the clavicle, from the anterior border of the trapezius to the posterior edge of the sterno-mastoid muscle. The platysma myoides and the fascia of the neck should then be divided on a director. The external jugular vein will be seen near the inner part of the wound, and must be held aside, together with any other veins that may traverse the space. In a similar way the omo-hyoid muscle must be drawn aside. The various parts should then be most carefully separated by means of a silver probe, until the outer margin of the scalenus anticus is felt. This will serve to guide the surgeon's finger to the first rib, and the artery will be felt passing over that bone. In order to avoid the vein, the aneurism needle should be passed from before backwards, and the surgeon must be careful not to mistake any of the branches of the brachial plexus for the artery, or to include them in the ligature.

Ligature of the axillary artery.—The axillary artery may be tied either in the upper or in the lower part of its [illegible] central portion lies so deep, is surrounded by so [illegible] nervous trunks, and gives off so many branches, that its deligation is impracticable.

The artery has been ligatured in the upper part of its course; but as, before it can be exposed, the dissection must be carried through a thick muscle and the costo-coracoid membrane divided, and as the cephalic and the axillary veins are in intimate relation with it, the operation should not be undertaken without very special reasons. It will generally be preferable to tie the subclavian in the third part of its course.

The axillary artery may be secured in the lower part of its course by raising the arm from the side, and making an incision in the axilla, over the head of the humerus, and in the line of the great vessels. By cautious dissection the median nerve and the axillary vein are brought into view. These must be held aside while the artery is separated with a silver probe, and a ligature is placed round it in the usual manner.

When considering the aneurisms which occur about the root of the neck and the axilla, we can hardly help coming to the conclusion that there are but few of them which can be successfully treated by the ligature of arteries; and that if surgery is ever to be able to cure them with any certainty, it must be by some other means. Possibly to some of them it may be found practicable to apply pressure in the way that has lately been so happily done to abdominal aneurisms (see p. 187); possibly galvano-puncture may suffice to cure others; while the well-known case in which Mr. C. Moore introduced a coil of iron wire into a thoracic aneurism may suggest means of dealing with others (*Med.-Chir. Trans.*, vol. xlvii).

Ligature of the brachial artery.—The brachial artery is generally tied at the middle of the upper arm. In this situation it lies under the inner edge of the biceps, covered only by the integument and fascia. It is accompanied by its two venæ comites, and at this point it is crossed, from without inwards, by the median nerve. It will here be found in close relation to the basilic vein, the ulnar nerve, and the inferior profunda artery.

An incision, about three inches long, is made along the inner border of the biceps, great care being taken to keep close to the edge of the muscle, which is a sure guide to the artery. After the skin has been divided, the fascia must be cautiously slit up on a director. The artery, with its venæ comites, and crossed by the median nerve, will then be exposed to view. The nerve must be gently drawn aside with a blunt hook, and the veins carefully separated from the artery; after which the ligature is passed round the vessel, and tied in the ordinary way.

Ligature of the radial artery.—It is often necessary to tie the radial artery at the wrist, where it lies beneath the integument and deep fascia, between the tendons of the supinator longus and the flexor carpi radialis. It is accompanied by its venæ comites, but in this situation it bears no immediate relation to its corresponding nerve.

The pulsation in the artery will form the best guide to its exact situation. If, however, an anatomical rule is wanted, we may say that in an adult it lies half an inch to the outer side of the flexor carpi radialis. An incision, about two inches long, should be made through the skin and superficial fascia. The deep fascia must then be cautiously divided, or slit up on a director. The artery must be separated from its venæ comites with the point of the scalpel, or with the finger-nail, and the ligature passed round the vessel.

Ligature of the ulnar artery.—It is generally in wounds of the palm that the ulnar artery requires to be tied, and then a ligature may conveniently be placed round it just above the wrist. In this situation it lies between the innermost tendon of the flexor sublimis digitorum and the tendon of the flexor carpi ulnaris. On its inner side it has the ulnar nerve.

An incision, two inches in length, should be made over the artery, a little to the outer side of the flexor carpi ulnaris. When the superficial and deep fascia have been divided, the vessel and its venæ comites will be exposed. In this case, it is important that the needle should be passed from the ulnar to the radial side, so as not to disturb or injure the nerve. As I have already said, bleeding from the radial, the ulnar, and other superficial arteries may often be quickly and easily controlled by acupressure, the needle being passed through the tissues on one side of the vessel, then across the artery, and then again through the tissues on the other side (see p. 51).

Ligature of the external iliac artery.—The course of the external iliac artery may be described by a line drawn from the left side of the umbilicus to a point midway between the anterior superior spine of the ilium and the symphysis pubis. It lies along the inner edge of the psoas muscle, in a sheath derived from the iliac fascia. Its accompanying vein will be found behind it, and a little to its inner side. It is overlaid in front by the peritoneum. Near its termination it comes into relation with the spermatic vessels and the vas deferens. On the front and inner side of the artery are a number of lymphatic glands with their vessels. The ligature must not be placed too near the internal iliac at the upper end, or the epigastric and circumflex vessels at the lower end.

The incision should be about three inches long. It [illegible] begin about half an inch above and to the outer side of the external abdominal ring, and be carried upwards and outwards, parallel to Poupart's ligament. When the aponeurosis of the external oblique muscle has been fairly exposed, it must be divided to the same extent, or slit up on a director. The internal oblique and transversalis must be cut through in the same way, but with even greater caution. The edges of the wound should then be retracted, and the fascia transversalis scratched through with the nail, and broken down with the finger. The peritoneum should next be very lightly and gently raised, and pushed upwards, until the vessel can be reached. An opening should then be made in the sheath, the artery carefully separated from the vein, and the aneurism needle passed from within outwards. The wound should be brought together with sutures, and pressure made upon it by means of a pad and bandage. The patient should be propped up in bed, so as to relax the abdominal muscles.

Before the operation is undertaken the rectum should be emptied, and the pubes shaved.

Ligature of the superficial femoral artery.—The superficial femoral artery is generally tied in Scarpa's triangle, just above the point where it is crossed by the sartorius muscle. It is here covered only by the integument and fascia lata, and has the superficial femoral vein almost immediately behind it.

The thigh should be slightly flexed and abducted, before the operation is commenced. The course of the artery may be ascertained by its pulsation, or by a line drawn from the middle of Poupart's ligament to the inner condyle of the femur. The incision should begin about three inches below Poupart's ligament, and be carried down the limb in the line of the artery for the space of four inches. The fascia lata should be divided to an equal extent, and the sartorius drawn a little outwards. The sheath of the vessel should then be raised with a forceps and opened, the flat of the blade being turned towards the artery. The aneurism needle should be passed from within outwards, great care being taken to avoid injuring the vein.

The point at which the ligature is applied should be about five inches below Poupart's ligament. When bleeding has ceased, the edges of the wound should be brought together with sutures and strips of plaster. The limb should be lightly covered with flannel, or enveloped in cotton-wool, so as to maintain an equable temperature, and diminish the chances of gangrene.

Ligature of the popliteal artery is rarely undertaken, except for wounds. In such a case, the opening should be enlarged, and the bleeding vessel secured, both above and below the seat of injury. In the upper part of the popliteal space, the tendon of the semi-membranosus may be taken as a guide to the artery, and the incision carried along its outer border. In this situation the internal popliteal nerve, and the popliteal vein, are both superficial to the artery, and a little to its outer or fibular side.

Ligature of the tibial arteries in the fleshy part of the leg is both a difficult and a dangerous operation, and one which ought not to be undertaken except for a wound of the vessel. In such a case, the wound should be enlarged, and a ligature placed both above and below the seat of injury.

The posterior tibial artery may easily be tied behind the inner malleolus. Here the vessel is covered only by the integument and by the deep fascia, which in this situation is unusually thick and dense, forming the internal annular ligament. A semilunar incision, about two inches in length, with its concavity turned towards the ankle, should be made, midway between the heel and the inner malleolus. The deep fascia should then be cautiously divided on a director, the artery separated from its venæ comites, and the aneurism needle passed from the heel towards the malleolus, so as to avoid the nerve, which lies between the artery and the tendo Achillis.

Ligature of the anterior tibial artery.—The anterior tibial artery may be tied in the lower third of the leg, where it lies between the tendons of the tibialis anticus and the extensor proprius pollicis. In this situation it is covered only by the integument and deep fascia. If the pulsation of the artery cannot be felt, the incision should be made half an inch outside the spine of the tibia, and in rather an oblique direction from within outwards. The tendons should be separated, and then the artery will be seen, accompanied by its venæ comites, and having the nerve in front of it.

The arteria dorsalis pedis may be secured on the instep, where it lies between the tendon of the extensor proprius pollicis and the innermost tendon of the extensor brevis digitorum. It is here covered only by the integument and deep fascia. It is rarely, however, that it requires to be tied, for bleeding from it can generally be controlled by acupressure, or by a pad and bandage.

EXCISION OF JOINTS.

When a joint connected with the extremities has become hopelessly diseased, or has been severely injured, it is the practice of modern surgeons to consider whether the disease cannot be taken away without removing the entire limb. Excision—[illegible] sometimes termed, *resection*—has been performed [illegible] every *joint of the* upper and lower extremities, [illegible] many of these operations are so satisfactory that they have taken an established place in practice.

Excision of the shoulder-joint.—In this, as in every operation of the kind undertaken for long-standing disease of the bone or for injury from direct violence, it is well to arrange the incisions so as to fall in with the existing sinuses or lacerations. The line of incision may take the shape of a T, or an L, or a U, or any other figure suited to the peculiarities of the case. The incision must be carried through the deltoid muscle, and the flaps be dissected back, so as to expose the joint. In a case of chronic disease, the capsule and tendons will probably be more or less destroyed; a few touches of the knife will suffice to divide them, and there will be no difficulty in turning out the head of the humerus. The diseased portion must be cut off with the saw, care being taken to remove as little as possible of the healthy bone. If the glenoid cavity is at all affected, the diseased bone should be scooped out with the gouge. When this has to be done, it indicates that the morbid action is extensive, and accordingly in these cases the prognosis is less favourable.

The flaps should be brought together by a few stitches, and the arm well supported in a sling.

Excision of the elbow may be performed either by a single longitudinal incision, or by one in the shape of an H or a T: probably the first is the best. In arranging his incisions, as well as in carrying out the operation, the surgeon must bear in mind the position of the ulnar nerve, which passes round the internal condyle of the humerus. When the flaps have been dissected back, the arm should be forcibly bent. The lateral ligaments may then be easily divided, and the joint exposed. The articular ends of the bones should next be removed with the saw, or with bone-pliers. If any points of disease present themselves on the sawn surfaces, they must be scooped out with the gouge. If the dissection is carried on close to the bone, the ulnar nerve ought not to be seen. The capillary hæmorrhage is sometimes very troublesome after this excision. In a case on which I operated there was great difficulty in arresting the flow of blood. The patient, a strumous boy, was much reduced; but he ultimately made a good recovery. When all bleeding has ceased, the edges of the wound should be drawn together with sutures, and the arm extended on a splint, or simply laid on a pillow. Mr. Maunder lays great stress upon preserving those fibres of the triceps which are inserted into the fascia of the forearm, especially that which covers the anconeus. Upon this, he says, depends the power of extension retained by the patient.

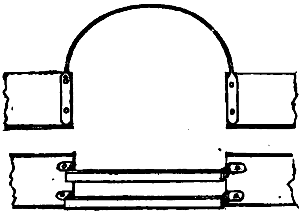
In both of these operations upon the upper extremity what we desire is ligamentous union, and not bony anchylosis. Therefore, after three weeks or a month, when granulation and cicatrization are complete, the surgeon should begin to make a little passive motion, and the patient should be encouraged to use his arm.

Excision of the wrist is an operation which cannot be said to have taken the same established place in surgery as many other proceedings of the same kind. The complex nature of the joint, and the number of tendons which pass over it, make the operation a difficult one; and when the diseased bone has been removed it is only too probable that the hand and arm which are left will be of but little use to the patient. If the operation is undertaken at all, the carpus may be reached by a semicircular flap on the dorsal aspect, and the extensor tendons held aside so as to expose the joint. Or the surgeon may prefer to make two lateral incisions, and to remove the joint in the way recommended by Mr. Lister. In the subsequent treatment of the case the splint devised by that well-known surgeon should be used, so as to support the hand, and to maintain the opposition between the thumb and the fingers (*Lancet*, March 25, 1865).

Excision of the hip-joint.—In some cases of chronic disease or gunshot injury the head of the femur may be excised with advantage.

A longitudinal incision should be made over the great trochanter. If need be, it may be converted into a T. The dissection should then be carried on until the flaps can be drawn back, and the articulation exposed. When the ligaments have been divided, the leg should be strongly adducted, and pushed upwards, so as to force the head of the femur out of the wound. The diseased portion may then be removed with the saw. The chain-saw, which enables the surgeon to cut from within outwards, is very applicable to this operation. If any part of the acetabulum is carious, it should be taken away with the gouge. The lèg should be maintained in the extended position by means of a long splint. Opposite the seat of operation, the splint should be interrupted, the continuity being kept up only by an iron bar in the way represented in Fig. 132, so as to allow the

Fig. 132.



Interrupted long splint.

wound to be dressed, without disturbing the position of the limb. When the cicatrix has healed, and the tissues have become consolidated, the patient may be permitted to walk about with crutches.

Excision of the knee is an operation which has been revived of late years; and it bids fair to become the established rule of practice in certain cases of disease or injury of the knee-joint.

A simple transverse incision should be made across the joint immediately below the patella. If this does not give space enough, it may be converted into an H incision. The flaps of skin are then raised and turned back. The ligament of the patella is divided, and the bone dissected away. If the surgeon wishes to retain the patella, it may be raised with the upper flap. The leg should then be strongly bent, the lateral and crucial ligaments divided, the ends of the bones cleared for the saw, and the interior of the joint exposed. The saw should then be applied to the femur, and a portion of the articular extremity removed. A thin slice is next to be taken from the upper end of the tibia. In using the saw, the surgeon must exercise caution, remembering that the popliteal vessels lie immediately behind the bone. The limb should then be extended, in order to see whether the bones come well together. Perhaps the saw may have to be used again. If the position is good, and the bleeding has ceased, the skin may be united by sutures, and the leg extended on a splint. That which is generally used in these cases is a M'Intyre's splint, laid straight, and cut down at the sides, opposite the seat of operation, so as to allow the wound to be dressed with ease.

The time during which the patient will have to be kept in bed after this operation varies extremely. But the surgeon will generally have reason to be satisfied, if his patient is able to get up at the end of two months, and walk about on crutches, with the leg supported by a gutta-percha or light wooden splint. What we desire in these cases is bony or fibrous anchylosis, and therefore no attempt should be made to flex the limb. It is quite possible, however, that in course of time the patient may get a little movement at the knee. But, whether this is the case or not, he will probably have a useful and serviceable limb. Of course it will be a little shorter than its fellow, and it will be necessary for the patient always to wear a high-heeled boot.

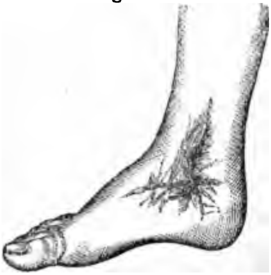
There has been much discussion of late years with regard to the relative value of excision and amputation for diseases and injuries of the knee-joint. Those to whom we are most indebted for bringing excision to the notice of the profession have not unnaturally been inclined to regard it with rather too favourable an eye; while others have been unjustly prejudiced against it altogether. Perhaps the time has hardly yet come for striking a balance between these two operations, and assigning to each its proper place in surgery. As no one has been at more pains to collect statistics on this subject than Mr. Bryant, or has analysed them more carefully, I shall quote one or two sentences from the general conclusions at which he has arrived. In these he touches upon some very important points—namely, the cases to which excision is, and the cases to which it is not, applicable, and also the relative mortality after the two operations.

"It would thus appear that it is in young adult life that excisions, although always more fatal than amputation, are the most justifiable; that in childhood they are far too dangerous; in patients past middle age all admit their inapplicability. And yet it must be admitted that excision of the knee-joint is a good operation; that, when successful, a good useful limb is given—a far better limb than can be given after amputation. Nevertheless, the truth must be recognised that the operation is, as hitherto practised, a far more fatal operation than amputation; and yet it may with confidence be asserted that the cases in which amputation has been performed are, as a rule, far more severe than those in which excision has been practised." ("Surgery," p. 862.)

Excision of the ankle-joint.—When the articular surfaces of the astragalus and the malleoli are diseased, while the calcaneum and the other bones of the tarsus are sound, the surgeon may undertake the excision of the ankle-joint with good hope of curing his patient. This operation I shall describe in Mr. Hancock's words, for no one has had a larger experience than he has in all that appertains to the surgery of the foot. After enumerating various incisions by which the ankle-joint has been reached, he says:—"I infinitely prefer the one semilunar incision extending across the front of the joint to behind the malleoli on either side, penetrating only to the fascia below. When the flap thus made is reflected, we have plenty of room wherein to manipulate; we can see the condition of parts and what we are doing; we can detach the tendons sufficiently from their grooves behind the malleoli to do away with the necessity of cutting them across, we greatly facilitate the eversion of the foot; and, as we can see what we are about, we are able to avoid wounding the posterior tibial artery—a point of vital importance to the success of the proceeding, since that mainly depends upon the anterior and posterior tibial arteries being preserved in their integrity." ("Surgery of the Human Foot," p. 311.)

Fig. 133 was drawn from a girl aged nine, upon whom Mr. Barwell had performed excision of the ankle three months previously.

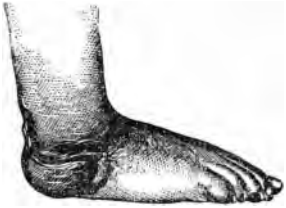
Fig. 133.



Foot after excision of the ankle.

I have already mentioned that when the astragalus is dislocated it may be removed, and still the patient may retain a very useful foot (see p. 183). If the astragalus, which plays such an important part in the mechanism of the foot, can be taken away without serious injury to the patient, it is not surprising that other bones of the tarsus can in like manner be dispensed with. There is hardly one of the numerous bones of the foot which has not been separately excised. This is one of the advantages which we owe to what Sir Wm. Fergusson has happily termed "conservative surgery." When disease is limited to one or two bones, surgeons are very unwilling to remove the whole, or the greater part, of the foot. They content themselves with excising the affected bones, or even with merely gouging out the dead tissue, and rely upon nature to repair the gap thus made. In this way, the calcaneum, the scaphoid bone, or the cuboid may be separately dealt with. Fig. 134 was drawn from the cast of a case in which Mr. Barwell excised the os calcis in this way. And it will be observed how little the removal of the calcaneum interferes with the length of the limb or the rotundity of the heel.

Fig. 134.



Foot after excision of os calcis.

AMPUTATIONS.

Amputations may be performed in two ways, either by the *circular* method or by *flaps*. In the former case the knife is carried evenly round the limb. This is repeated three or four times, until the whole of the tissues are divided—an assistant, meanwhile, drawing the tissues equally and steadily upwards; so that, when the parts are relaxed, the sawn end of the bone will be seen at the apex of a hollow cone formed by the muscles and skin.

The flap operation is performed by making a couple of flaps from the opposite sides of the limb. Sometimes they are of equal length; sometimes one is longer than the other; sometimes they are made by cutting from without inwards; sometimes by transfixing the limb, and cutting from within outwards. Sometimes the flaps consist merely of the skin, at other times they include the whole thickness of the soft tissues.

Speaking generally, the advantages of the *circular operation* are these :—That it is easily performed, and requires but little skill or practice; that the vessels are cut transversely, whereas in the flap operation they are divided obliquely; and that the resulting stump is generally satisfactory.

The advantages of the *flap operation* are—That the surgeon can take the flap from any point that he likes, and so make the most of the sound parts; that the sides of the wound come together more accurately, and unite more readily; and that the operation itself can be performed in a shorter time.

The late Mr. Teale, of Leeds, introduced a modification of the flap operation, which has special advantages:—

He directs that a rectangular flap, equal in length and breadth to one-half the circumference of the limb at the seat of operation, should be taken from the extensor side; and that a short rectangular flap, equal only to a quarter of the length of the other, should be taken from the flexor side. The advantages of this method are said to be, that the principal vessels and nerves are not included in the flap which forms the bearing-point of the stump; that the flap covers the ends of the bones in such a way as to close them at an early date; that the cicatrix is drawn well up above the extremity of the stump, and yet tension is prevented by the great length of the flap.

Every amputation should be performed as far from the trunk as the circumstances of the case will allow. The mortality increases in direct proportion as we ascend the limbs.

During the operation, the main artery should, if possible, be compressed, either by the fingers of an assistant, or by a tourniquet.

Amputation of the finger.—When the last phalanx is necrosed, it may often, as we have elsewhere explained, be removed by lateral incisions. In this way the pulp and the nail are left, and will form a very useful point to the finger.

When it is necessary to amputate either of the last two phalanges, the finger should be strongly bent, and a transverse incision made on the extensor side, a little below the highest point of the flexure; the lateral ligaments should be divided, the joint opened, and the flap taken from the palmar surface. Or the palmar flap may be made by transfixion, and the joint opened afterwards, either from its palmar or dorsal aspect.

Amputation at the metacarpo-phalangeal joint may be best performed by the oval method. The point of the knife is placed on the back of the metacarpal bone, about half an inch above its head, and drawn obliquely downwards to the middle of the interdigital web. It is then carried across the fold, which separates the finger from the palm, and brought up through the web on the other side, to the spot where it commenced. The lateral ligaments must next be divided, and the disarticulation completed. The head of the metacarpal bone should then be removed with bone pliers, and the edges of the wound brought together. The hand should be laid on a splint, the wound covered with a suitable dressing, and the finger-ends drawn together, and fixed by means of a strip of plaster. In labouring people, to whom the breadth of the palm is more important than elegance of shape, it may sometimes be well to leave the head of the metacarpal bone. In this case, however, the incision must be carried a little further forward on the flexor side of the finger, so as to form a sufficient flap.

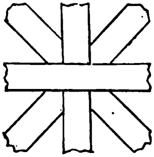
The thumb may be amputated either by an oval incision, beginning at the carpo-metacarpal joint, passing round the web, and returning to the same point again: or an incision may be made along the dorsal aspect, from the carpo-metacarpal articulation to the middle of the web; the ball of the thumb may then be transfixed, and a flap made by cutting from within outwards. In any case, it is better, if possible, not to open the carpo-metacarpal joint, but to cut the bone through near its base. When the metacarpal bone of the thumb is necrosed, it may be exposed by direct incision, the disease taken away, and the phalanges left. In dealing with the thumb, it is of great importance to leave as much as possible, to serve as an opponent to the fingers.

Amputation at the wrist may be performed thus:—An assistant should grasp the arm and draw the tissues well up. A semilunar incision, with the convexity downwards, is then made across the back of the wrist. This flap is raised, the tendons and ligaments are divided, and the joint is opened from its dorsal aspect. The knife is then carried through, and a second flap is taken from the palm. The styloid processes may require to be cut off, or the articular surfaces of the bones removed, before the flaps are brought together.

Amputation of the forearm may be performed either by a circular, or by a flap operation.

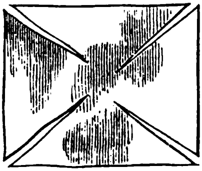
In the circular operation the tissues of the limb throughout its whole circumference are to be drawn evenly upwards by an assistant. The surgeon then makes a circular incision round the limb down to the fascia. The skin is next drawn as much farther up as possible. A second circular incision is made through the

Fig. 135.



Dressings for a stump.

Fig. 136.

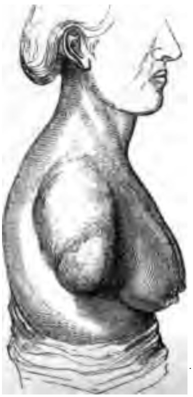


Dressings for a stump.

muscles, immediately below the line of the skin. The bones are then cleared, and the saw applied to both at once.

Or a flap operation may be performed. In this proceeding the hand should be held midway between pronation and supination, and then two equal flaps should be made by transfixion, one from the extensor, and the other from the flexor side. Or Mr. Teale's method may be adopted, and a long, rectangular flap may be taken from the extensor side, and brought over to meet a short one on the flexor side.

Fig. 137.



Stump after amputation through the [illegible]

In dressing the stump which is left after such an amputation as this, either in the upper or lower extremity, the surgeon may take strips of lint of sufficient length, and fold them over the end of the stump in a longitudinal direction, and at an angle with one another, until the whole surface is covered (Fig. 135); or he may cut out a piece of lint in the shape of a Maltese cross, and lay its central portion upon the end of the stump, while he folds down the corners (Fig. 136). In either case the dressings should be secured by a few circular turns of a roller round the limb in the manner represented in Fig. 139.

Amputation of the upper arm is usually best performed by a couple of lateral flaps made by transfixion. But if the limb is very muscular, a better result may, perhaps, be obtained by a combination of the flap and the circular methods. Two skin-flaps [illegible] by dissecting from without inwards, and then the muscles may be divided by a circular sweep of the knife.

Fig. 137 represents the stump, three years after operation, in a middle aged woman, whose arm I amputated on account of injuries received by a railway accident.

Amputation at the shoulder-joint may be performed either by transfixion, or by cutting from without inwards.

If the method by transfixion is preferred, the arm should be raised from the side, and then the knife should be passed from a point a little in front of the acromion to the posterior margin of the axilla, and carried downwards, so as to include nearly the whole of the deltoid muscle in the flap. The capsule of the joint is next to be opened, the tendons and ligaments divided, the knife carried over the head of the bone and down the neck, and then made to cut its way out, leaving an inner flap about three inches in length. Before the inner flap is cut, an assistant should grasp the whole thickness of the soft tissues which will compose it, so as to control the artery, and prevent hæmorrhage, when it is divided.

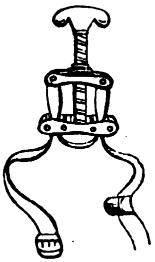
If the other method is adopted, an outer flap, of the same size and shape as in the preceding case, should be made by cutting from without inwards. The dissection must then be carried on underneath this flap, until it can be turned back so as to expose the joint. The other steps of the operation are the same as those which have been already described.

Amputation at the hip-joint is performed by transfixion, a long flap being taken from the front of the thigh, and a short posterior one from the gluteal region. The knife should be passed obliquely through the thigh immediately in front of the joint, entering a little below the anterior superior spine of the ilium, and emerging just above the tuber ischii, or *vice versâ*. As the knife cuts its way outwards, the fingers of an assistant should be introduced immediately behind it, so as to grasp the whole breadth of the flap, and compress the femoral artery. The capsule is then to be opened, the ligaments divided, the knife carried round the head of the bone, and the posterior flap fashioned. In order to facilitate the operation, it ought to be the sole duty of an assistant, to move the limb in such a way as to stretch the capsule and ligaments, make the head prominent, and raise it out of the socket. Before undertaking an amputation at the hip-joint, the surgeon should restrain the circulation through the leg by applying Lister's compressor over the abdominal aorta.

Amputation of the thigh may be performed either through the trochanters, or in the middle of the thigh, or above the knee.

The first step is to apply a tourniquet to the femoral artery in Scarpa's triangle. The tourniquet which is generally used for this purpose (Petit's), consists of a pad which is placed over the artery, a strap of webbing which passes round the limb, and a screw which acts upon the strap and tightens it. (Fig. 138.) By turning the screw the two plates over which the strap passes are separated, the strap is put upon the stretch, and pressure is made upon the pad. The pad should be placed as nearly as possible opposite the screw, and the buckle should be adjusted in such a manner as not to interfere with the working of the instrument. Instead of the pad which is usually sold with the tourniquet, it will often be found more convenient to lay a firm roll of bandage, about an inch in diameter, along the course of the artery, and then to pass a strap over it. In this way the instrument may be shifted without interfering with the position of the roll of bandage which serves as a pad. The screw should not be turned until the moment when the incisions are about to be made; for, if it is, the parts will become congested, and there will be an unnecessary loss of blood. For the same reason, as soon as the principal vessels have been tied, the tourniquet should be thoroughly relaxed, so that no impediment may be offered to the return of the venous blood.

Fig. 138.



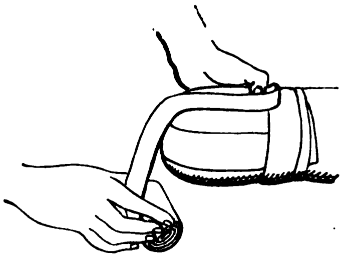
Petit's tourniquet.

When the amputation is high up in the thigh it is impossible to use Petit's tourniquet; and then the surgeon must either apply a compressor over the abdominal aorta, or he must direct an assistant to make digital pressure upon the common femoral artery as it passes over the brim of the pelvis.

In the upper part of the thigh, the operation by means of antero-posterior flaps, made by transfixion, is the most suitable; or the anterior flap may be made by transfixion, and the posterior one by a transverse semicircular sweep of the knife. In the middle and lower parts, the surgeon has his choice of several methods. He may perform a circular operation; or a flap operation with antero-posterior flaps made by transfixion, or with lateral flaps made in the same way; or he may prefer the rectangular flaps (Teale's); or he may make skin flaps, by cutting from without inwards, and divide the muscles circularly. In making lateral flaps, the inner flap, which contains the large vessels, should always be made last.

Dressings may be applied to the stump in the manner that I have explained in speaking of amputation of the fore-arm. In bandaging a stump in the thigh the surgeon begins by taking one or two circular turns round the part, with the view of fixing the end of the roller—holding it (let us suppose) in his right hand. Then he secures the last fold with the thumb of his left hand, while with the other he carries the bandage at right angles over the end of the stump to a point directly opposite to that from which he started. Here he secures the bandage with the fingers of his left hand, while he takes a circular turn round the limb to fix the fold which passes over the stump. Or he may take two or three folds consecutively, and then fix them all by a single turn round the limb. These steps he repeats as often as they are necessary, until the whole of the stump is covered. (Fig. 139.)

Fig. 139.



Bandage for a stump.

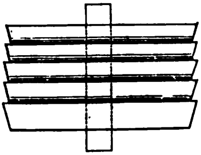
Amputation at the knee-joint is an operation which has occasionally been performed ever since the fifteenth century; but it is only of late that it has taken an established place in surgery, in consequence of the recommendation of Velpeau, Syme, and more particularly of Mr. G. D. Pollock. His paper upon the subject in the 53rd volume of the *Medico-Chirurgical Transactions*, gives a full account of the operation, and of the way in which it should be performed under different circumstances. Speaking generally, a large and broad flap should be taken from the front of the leg, and a shorter one from the back. They should consist of nothing but the integument. The patella and the condyles of the femur need not be touched, unless they are ulcerated; in which case the patella should be dissected out, and a sufficient slice taken off the condyles of the femur to remove the whole of the disease. Mr. Pollock speaks favourably of the operation, both as regards the stump which is left, and as to the mortality when compared with amputation through the thigh.

Amputation of the leg may be performed either immediately below the knee, or in the middle of the leg, or in its lower third.

A semicircular flap is taken from the front of the leg, by cutting from without inwards; the limb is then transfixed—

care being taken not to pass the knife between the bones—and a long thick flap is made from the posterior aspect. Or, the surgeon may adopt Mr. Teale's plan, and mark out a couple of rectangular flaps, the longer one being taken from the extensor, and the shorter from the flexor side. Or, he may prefer to use the circular method.

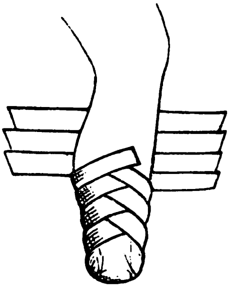
Fig. 140.



Many-tailed bandage.

In dressing a stump in the leg the many-tailed bandage is often useful, and we may take this opportunity of describing it, though it is suitable to other situations as well. It is made in the following manner:—The surgeon cuts a number of strips of "leg bandage," sufficiently long to go once and a half round the part. These he lays in regular order, from above downwards, one overlapping the other to about a third of its width. It will be seen immediately that it is necessary to follow this plan in order that the bandage may lie flat, when it is applied, according to the general rule, from below upwards. A sufficient number of strips ought to be taken to cover the whole extent of surface to which the bandage has to be applied, and the length of the pieces must vary according to the size of the part which they have to surround. Sometimes the strips are stitched to a longitudinal band, which serves to keep them in their places. (Fig. 140.) When the bandage has been prepared the limb is laid upon it, or the strips, arranged upon a piece of pasteboard, are slipped under the limb; and then each separate piece is made to encircle the part, the ends being brought up one on each side and crossed in front. The lowest piece should be folded first, and then the pieces should be taken in regular order from below upwards. This is a very convenient bandage where the surgeon thinks it a matter of importance to keep the affected part as quiet as possible. It serves to retain dressings, and at the same time it gives a slight amount of support. Moreover, as it is capable of being unfolded piece by piece, the stump may be readily exposed without interfering to any extent with the com-

Fig. 141.



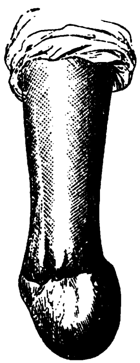
Mode of applying the many-tailed bandage.

fort of the patient. The annexed illustration represents a stump in the lower third of the leg, partially covered by a many-tailed bandage. (Fig. 141.)

Amputation at the ankle-joint (*Syme's operation*) is performed by making an incision from one malleolus to the other, across the under-surface of the foot, immediately in front of the heel. The points of this incision are then united by a second, passing across the instep. Or the superficial incision may be made at one sweep, the knife being carried across the instep and round the front of the heel, to the point where it began. The joint should then be opened from the front, the tendons and ligaments divided, and the dissection carried round the os calcis—great care being taken to keep close to the bone, particularly on the inner side, where it is in contact with the posterior tibial vessels. The malleoli should then be cut off, and the flaps brought together. The advantages of this operation are, that the foot is removed, while the limb is but little shortened, and that an excellent covering is made for the end of the stump from the thick and tough skin of the heel.

M. Pirogoff has introduced a modification of this operation, which consists in leaving the posterior half of the os calcis, and turning it up, so as to bring the sawn surface into apposition with the ends of the tibia and fibula. In performing the operation an incision should first be made from one malleolus to the other, passing under the sole. This incision should not be vertical, but tending slightly forwards in an oblique direction. The flap thus indicated should be carefully dissected back for a short distance. The ankle-joint is next opened by an incision across the instep, and the astragalus is disarticulated. The saw is then applied to the upper surface of the os calcis, immediately behind the articulation with the astragalus, and the bone is cut through from above downwards, and in an oblique direction from behind forwards. The malleoli, together with the articulating surfaces of the tibia and fibula, are sawn off, and the operation is completed by bringing the two osseous surfaces into contact, and uniting the line of incision by interrupted sutures. By this operation the length of the limb is preserved, while the resulting stump has a covering of the naturally thick skin which

Fig. 142.



Stump after Pirogoff's operation.

protects the heel. Fig. 142, which was taken from a case of Mr. Canton's, shows what a satisfactory stump may be obtained by this operation. It should not be undertaken where there is extensive disease of the tarsus, even though the os calcis may be sound; for in such instances the disease is very apt to manifest itself in the stump. But in cases of injury it is an excellent operation.

In cases in which the anterior bones of the tarsus are diseased or injured, while the astragalus and os calcis remain healthy, Mr. Hancock has devised, and practised with success, an operation whereby the calcaneum is sawn through obliquely, the front of the foot taken away, the head of the astragalus and its inferior articulating surfaces removed, and the sawn surface of the heel-bone brought into apposition with the under surface of the astragalus. By this operation the ankle-joint is left intact; the stump is formed by the tuberosity of the os calcis, which is retained in the integument, and covered by the thick skin which is natural to it. ("Surgery of the Human Foot," p. 209.)

Amputation through the tarsus (*Chopart's operation*) consists in disarticulation between the os calcis and astragalus on the one hand, and the scaphoid and cuboid on the other (Fig. 143, *a*). The sole-flap should first be marked out by an incision from the tubercle of the scaphoid, along the side of the foot, to the ball of the great toe; the knife should next be carried across the sole, a little behind the roots of the toes; and then turned along the outer side of the foot, to a point a little behind the prominent base of the fifth metatarsal bone. An incision is next to be made across the instep, so as to unite the ends of the former incision. The dorsal flap is then to be turned back, the articulation opened, and the dissection carried on close to the under surface of the bones, so as to leave the whole of the soft tissues of the sole in the plantar flap.

This is a good operation, and the result is generally satisfactory; and when a methodized operation through the tarsus is required, the surgeon can adopt no better. But, as I have already said, there is at the present day a strong tendency among surgeons to remove only the diseased or mutilated parts, and to retain all that can with any propriety be left. This practice is founded upon the confident expectation that nature will bind together and utilize all that remains, but still more upon the ascertained fact that the mortality increases in direct proportion to the amount that is taken away. Acting upon this principle in the case of a man, aged sixty-one, who was injured in a railway accident, I disarticulated the three cuneiform bones from the scaphoid, and sawed off the projecting extremity of the cuboid. The patient made an excellent recovery, and the appearance of the stump, some two years after the operation, is represented in Fig. 144. The particulars of the case are related in the *Lancet* of Nov. 20, 1869.

Amputation at the line of the metatarsal bones (*Hey's operation*), consists in making a large plantar flap and a small dorsal one, and then disarticulating the metatarsal from the tarsal bones. (Fig. 143, *b*.) In doing this, the surgeon should bear in mind, that the base of the second metatarsal bone is deeply sunk between the internal and external cuneiform bones. As disarticulation is difficult, and offers no special advantages, the bones are sometimes sawn through just in front of the joints. This I have seen done by Sir Wm. Fergusson, with excellent results, in the case of a sailor who had lost his toes from frost-bite consequent upon long immersion in the sea.

Fig. 143.

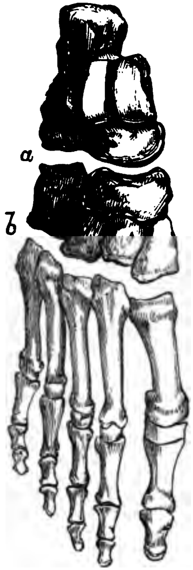
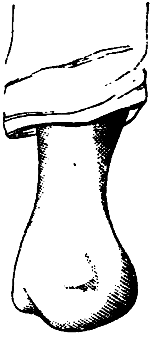


Diagram of the bones of the foot.

The metatarsal bone of the great toe, which is often affected by strumous disease, may be removed by an incision carried along its dorsal surface, from its base to its head, and then turned down, at right angles, to the ball of the toe. The surgeon should be careful not to interfere with the sole; and, if possible, the base of the bone should be left, because it gives insertion to the peroneus longus.

Fig. 144.



Stump after amputation through the tarsus.

The toes, or any of their phalanges, may be amputated much in the same way as the corresponding parts of the hand.

The toes should be removed by the oval method, the surgeon commencing his incision on the dorsal surface, well above the web, and carrying it obliquely forward, so that on the plantar surface it may not interfere with the tread of the foot.

FORMULÆ AND RECEIPTS.

The Doses are apportioned for Adults, and the mixtures and pills are to be taken three times a day, except where otherwise stated.

1. Fotus Belladonnæ.

℞ Extracti belladonnæ	gr. 60

To be dissolved in one pint of boiling water, and used as a fomentation.

2. Fotus Papaveris.

℞ Capsul. papaveris contus.	℥j
Aquæ destillatæ	Oj

Mix, and boil for a quarter of an hour; then strain through muslin.

3. Guttæ Argenti Nitratis.

℞ Argenti nitratis	gr. 1—2
Aquæ destillatæ	℥j

Misce.

To be dropped into the eye with a glass rod or a camel's-hair brush.

4. Guttæ Atropiæ Sulphatis.

℞ Atropiæ sulphatis	gr. 1—4
Aquæ destillatæ	℥j

Misce.

5. Haustus Hyoscyami.

℞ Tinct. hyoscyami	♏ 25—50
[vel Tinct. lupuli	♏ 30—60]
Liq. ammoniæ acet.	ʒj
Syr. Tolutani	ʒij
Mist. camphoræ	ad ℥iss

Misce.

A soothing or sleeping draught, without opium. To be taken at bedtime, or night and morning.

6. Injectio Boracis et Glycerini.

℞ Glycerini	℥ij
Boracis	ʒj
Aquæ	℥ij

Misce.

Put ʒj or ʒij into ℥iv of warm water, and inject into the bladder in cases of cystitis. (Sir H. Thompson.)

7. Injectio Morphiæ.

℞ Morphiæ acetatis	gr. 80
Aquæ destillatæ	ʒj

Rub the acetate gradually with the water, and add a few drops of acetic acid, if necessary for perfect solution. Six drops contain one grain of acetate of morphia. For subcutaneous injection. (*Middlesex.*)

8. Linctus Morphiæ.

℞ Liq. morphiæ	♏ 4
Aquæ laurocerasi	♏ 2
Syr. Tolutani	♏ 30
Glycerini	ad ʒj

Misce.

Dose—a teaspoonful occasionally.

9. Lotio Acidi Carbolici.

℞ Acidi carbolici crystalli	gr. 1
Aquæ destillatæ	♏ 40

Misce. (*St. George's, Charing Cross.*)

10. Lotio Acidi Nitrici.

℞ Acidi nitrici fort.	♏ 4
Tinct. opii	♏ 6
Aquæ destillatæ	ʒj

Misce. (*King's College.*)

11. Lotio Acidi Sulphurosi.

℞ Acidi sulphurosi	ʒj
Aquæ destillatæ	ad ℥j

Misce. (*Middlesex.*)

12. Lotio Acidi Tannici.

℞	Acidi tannici	gr. 4
	Sp. vini rectificati	♏ 30
	Aquæ rosæ	ʒij
	Aquæ destillatæ	ad ℥j

Misce.

13. Lotio Aluminis Mitior.

℞	Aluminis exsiccati	gr. 3
	Aquæ destillatæ	℥j

Misce.

14. Lotio Aluminis Fortior.

℞	Aluminis exsiccati	gr. 6
	Aquæ destillatæ	℥j

Misce.

15. Lotio Ammon. Hydrochlor.

℞	Ammoniæ hydrochloratis	gr. 24
	Acidi acetici diluti	♏ 48
	Sp. vini rectificati	♏ 30
	Mist. camphoræ	ad ℥j

Misce.

16. Lotio Arnicæ.

℞	Tinct. arnicæ	♏ 20
	Liq. ammon. acet.	♏ 30
	Sp. rosmarini	♏ 15
	Aquæ destillatæ	ad ℥j

Misce.

17. Lotio Boracis et Glycerini.

℞	Boracis	gr. 6
	Glycerini	ʒj
	Aquæ sambuci	ʒij
	Aquæ destillatæ	ad ℥j

Misce.

18. Lotio Evaporans.

(1)	℞	Sp. ætheris nitrosi	♏ 10
		Aceti aromatici	♏ 2
		Aquæ destillatæ	℥j

Misce.

(2) ℞ Ammoniæ hydrochloratis	gr. 12
Sp. vini rectificati	♏ 36
Aquæ	ad ℥j
Misce.	(*Charing Cross.*)

(3) ℞ Liq. ammoniæ acet.	♏ 108
Sp. vini rectificati	♏ 108
Aquæ	ad ℥j
Misce.	(*St. Thomas's.*)

19. Lotio Myrrhæ.

℞ Tinct. myrrhæ	♏ 72
Aquæ	ad ℥j
Misce.	(*King's College.*)

20. Lotio Plumbi.

℞ Plumbi acetatis	gr. 2
Acidi acetici dil.	♏ 2
Aquæ destillatæ	℥j
Misce.	

21. Lotio Plumbi c. Opio.

℞ Tinct. opii.	ʒj
Sp. rosmarini	ʒj
Liq. plumbi subacetatis dil.	ad ℥j

Useful for irritable ulcers, chilblains, &c.

22. Lotio Zinci Sulphatis (L. rubra).

℞ Zinci sulphatis.	gr. 1
Sp. rosmarini	♏ 15
Tinct. lavandulæ co.	♏ 15
Aquæ destillatæ	℥j
Misce.	(*Middlesex.*)

23. Lotio Zinci et Aluminis.

℞ Zinci sulphatis.	gr. 2
Aluminis exsiccati	gr. 4
Aquæ	℥j
Misce.	

Useful in some acute forms of ophthalmia.

24. Lotio Zinci Chloridi (Mitior).

℞ Zinci chloridi	gr. 1—5
Aquæ	℥j

Misce.

25. Lotio Zinci Chloridi (Fortior).

℞ Zinci chloridi	gr. 20—40
Aquæ.	℥j

Misce. (Mr. Campbell De Morgan.)

26. Mistura Acidi Nitrici Dil.

(1) ℞ Acidi nitrici dil.	♏ 15
Tinct. lupuli	♏ 45
Inf. cascarillæ	℥j

Misce. (*University College.*)

(2) ℞ Acidi nitrici dil.	♏ 10
Tinct. card. co.	ʒj
Infusi gentianæ co.	℥jss

Misce. (*St. Thomas's.*)

27. Mist. Acidi Nitro-Hydrochlor. Dil.

(1) ℞ Acidi nitro-hydrochlor. dil.	♏ 15
Infusi chiratæ	℥j

Misce. (*King's College.*)

(2) ℞ Acidi nitro-hydrochlor. dil.	♏ 5
Tinct. chiratæ	♏ 20
Syr. aurantii	ʒj
Infusi aurantii	ad ℥j

Misce.

(3) ℞ Acidi nitro-hydrochlor. dil.	♏ 5—10
Sp. chloroformi	♏ 10—15
Ext. cinchonæ flavæ liq.	♏ 10—15
Aquæ	ad ℥j

Misce.

28. Mistura Acidi Sulph. Dil.

℞ Acidi sulphurici dil.	♏ 10
Decocti cinchonæ	℥j

Misce. (*St. Thomas's.*)

29. Mistura Salina.

℞	Sp. ætheris nitrosi	ʒij
	Liq. amon. acet.	ʒiij
	Aquæ camphoræ	ad ℥jss

Misce.

30. Mist. Ammoniæ Carb.

(1) ℞	Ammoniæ carb.	gr. 3
	Infusi cinchonæ	ʒj

Misce. (*King's College.*)

(2) ℞	Ammoniæ carb.	gr. 3—5
	Tinct. card. co.	ʒj
	Sp. chloroformi	♏ 30
	Tinct. chiratæ	♏ 5
	Syr. aurantii	ʒjss
	Aquæ	ad ℥jss

Misce.

31. Mist. Ammoniæ Effervescens.

(1) ℞	Ammoniæ carb.	gr. 10
	Sp. ammon. aromat.	♏ 10
	Syr. zingiberis	ʒj
	Aquæ	ad ℥

To be taken in effervescence with

Acidi tartarici	gr. 8
Aquæ	℥ss

(2) ℞	Ammoniæ carb.	gr. 6
	Sp. chloroformi	♏ 20
	Tinct calumbæ	♏ 10—20
	Syr. zingiberis	♏ 30
	Aquæ	ad ℥j

To be taken in effervescence with a table-spoonful of fresh lemon juice.

32. Mist. Ammoniæ Hydrochloratis.

℞	Ammoniæ hydrochlor.	gr. 5
	Acidi hydrochlor. dil.	♏ 8
	Syr. rhœados	♏ 25
	Aquæ destillatæ	ad ℥j

Misce.

33. Mist. Ammoniæ c. Scilla.

(1) ℞	Ammoniæ carb.	gr. 3—5
	Sp. chloroformi	♏ 20—30
	Tinct. scillæ	♏ 10—15
	Infusi senegæ	ad ℥j

Misce.

(2) ℞	Sp. ammoniæ aromat.	♏ 20
	Sp. chloroformi	♏ 20
	Oxymel. scillæ	♏ 10
	Aquæ	ad ℥j

Misce.

34. Mist. Antimonii Tartarati.

(1) ℞	Antimonii tartarati	gr. ⅛
	Liq. ammoniæ acet.	ʒij
	Aquæ camphoræ	ad ℥j

Misce. *(St. Mary's.)*

(2) ℞	Vini antimonialis	♏ 20
	Liq. ammoniæ acet.	ʒiss
	Tinct. hyoscyami	♏ 15
	Aquæ destillatæ	ad ℥j

Misce.

35. Mist. Antimonii Tart. c. Opio.

℞ Antimonii tartarati	gr. 4
Tinct. opii	♏ 40
Aquæ	℥viij

Misce.

One table-spoonful to be taken every hour. (Dr. Graves.)

36. Mist. Cathartica.

℞ Tinct zingiberis fort.	♏ 5
Magnesiæ sulph.	gr. 120
Syr. sennæ	ʒj
Mannæ	gr. 30
Infusi sennæ	ad ℥jss

Misce.

A draught to be taken in the morning.

37. Mist. Chloral. Hydrat.

℞ Chloral. hydrat.	gr. 10
Tinct. aurantii	ʒj
Aquæ	ad ℥jss

Misce.

A draught to be taken at bedtime.

38. Mist. Copaibæ.

℞ Copaibæ	♏ 20
Mucilaginis acaciæ	ʒijss
Aquæ cinnamomi	ad ℥j

Misce.

39. Mist. Ferri Iodidi.

℞ Syr. ferri iodidi	ʒj
Syr. rhœados	♏ 15
Aquæ	ad ℥j

Misce.

40. Mist. Ferri et Mag. Sulph.

℞ Ferri sulphatis	gr. 2
Magnesiæ sulphatis	gr. 20
Acidi sulph. dil.	♏ 10
Aquæ pimentæ	℥j

Misce.

41. Mist. Ferri Perchloridi.

℞ Tinct. ferri perchloridi	♏ 10
Sp. chloroformi	♏ 20
Inf. quassiæ	ad ℥j

Misce.

42. Mist. Ferri c. Zingibere.

℞ Tinct. ferri perchlor.	♏ 10
Tinct. zingiberis	♏ 30
Syr. simplicis	ʒj
Aquæ	ad ℥j

Misce.

43. Mist. Hydrargyri Iodidi.

℞	Liq. hydrarg. perchloridi	ʒj
	Potassii iodidi	gr. 5
	Infusi quassiæ	ad ℥j

Misce.

44. Mist. Hydrarg. Perchloridi.

(1) ℞	Liq. hydrarg. perchlor.	ʒj
	Tinct. gentianæ co.	♏ 20—30
	Syr. aurantii	♏ 30
	Aquæ destillatæ	ad ℥j

Misce.

(2) ℞	Hydrarg. perchloridi	gr. $\frac{1}{12}$
	Sp. vini rectificati	♏ 10
	Aquæ	℥j

Misce. (*London.*)

45. Mist. Potassæ Acetatis.

(1) ℞	Sp. ætheris nitrosi	♏ 30
	Potassæ acetatis	gr. 20
	Decocti scoparii	℥j

Misce. (*Charing Cross.*)

(2) ℞	Potassæ acetatis	gr. 10
	Tinct. scillæ	♏ 15
	Sp. ætheris nitrosi	♏ 20
	Tinct. hyoscyami	♏ 10
	Aquæ	ad ℥j

Misce.

A useful diuretic mixture.

46. Mist. Potassæ Bicarbonatis.

(1) ℞	Potassæ bicarb.	gr. 10—20
	Syr. zingiberis	ʒj
	Aquæ	ad ℥j

Misce.

Ten or fifteen drops of the vinum colchici, and the same quantity of the tincture of hyoscyamus, may be added to each dose if the patient is of a gouty habit.

(2) ℞ Potassæ bicarb.	gr. 30
Syr. simplicis	♏ 30
Aquæ	℥jss

To be taken in effervescence with a dessert-spoonful of fresh lemon juice.

47. Mist. Potassii Bromidi.

℞ Potassii bromidi	gr. 15
Infusi quassiæ	℥j

Misce. *(Charing Cross.)*

48. Mist. Potassii Bromidi Co.

℞ Potassii bromidi	gr. 10
Sp. chloroformi	♏ 18
Infusi quassiæ	℥j

Misce. *(University College.)*

49. Mist. Potassæ Chloratis.

℞ Potassæ chloratis	gr. 6
Syr. Tolutani	ʒj
Aquæ destillatæ	ad ℥j

Misce.

50. Mist. Potassii Iodidi.

(1) ℞ Potassii iodidi	gr. 3—5
Tinct. aurantii	♏ 20
Sp. chloroformi	♏ 5
Infusi gentianæ co	ad ℥j

Misce.

(2) ℞ Potassii iodii	gr. 5
Ext. sarsæ liq.	ʒj

Misce.

To be taken in two table-spoonfuls of water.

(3) ℞ Potassii iodidi	gr. 5—10
Sp. ammoniæ aromat.	♏ 30
Tinct. aurantii	♏ 40
Syr. aurantii	ʒj
Aquæ	[illegible]

Misce.

(4) ℞	Potassii iodidi	gr. 5—10
	Tinct. card. co.	♏ 20
	Sp. chloroformi	♏ 10
	Syr. zingiberis	ʒj
	Aquæ	ad ℥j

Misce.

51. Mist. Potassii Iodidi c. Colchico.

℞	Potassii iodidi	gr. 2—5
	Potassæ bicarb.	gr. 10
	Tinct. colchici	♏ 10—20
	Aquæ destillatæ	ad ℥j

Misce.

52. Mist. Potassii Iodidi c. Ferro.

(1) ℞	Potassii iodidi	gr. 2½
	Ferri et ammoniæ citratis	gr. 5
	Aquæ pimentæ	℥j

Misce. (*London.*)

(2) ℞	Potassii iodidi	gr. 10
	Ferri tartarati	gr. 20
	Aquæ	℥j

Misce. (*King's College.*)

(3) ℞	Potassii iodidi	gr. 5
	Sp. ammon. aromat.	♏ 20
	Ferri tartarati	gr. 10
	Aquæ destillatæ	℥j

Misce.

(4) ℞	Potassii iodidi	gr. 3—5
	Ferri et ammoniæ cit.	gr. 5—10
	Sp. chloroformi	♏ 20—30
	Aquæ	ad ℥j

Misce.

53. Mist. Potassæ Liquoris.

(1) ℞	Liq. Potassæ	♏ 10—20
	Liq. opii sed.	♏ 5—10
	Mist. amygdalæ	℥j

Misce.

(2) ℞	Liq. potassæ	♏ 10—20
	Tinct. hyoscyami	♏ 10—15
	Aquæ camphoræ	℥j

Misce.

54. Mist. Potassæ Nitratis.

℞ Potassæ nitratis	gr. 15.
Sp. ætheris nitrosi	♏ 15
Syr. limonis	♏ 40
Aquæ menthæ	℥j

Misce. (*Guy's.*)

55. Mist. Quiniæ.

(1) ℞ Tinct. quiniæ	ʒj
Syr. simplicis	♏ 30
Aquæ	ad ℥j

(2) ℞ Tinct. quiniæ	♏ 20
Acidi sulph. dil.	♏ 5
Syr. simplicis	♏ 30
Aquæ destillatæ	ad ℥j

56. Mist. Quiniæ c. Ferro.

(1) ℞ Quiniæ sulphatis	gr. 1
Ferri sulphatis	gr. 1
Acidi sulph. dil.	♏ 3
Syr. simplicis	ʒj
Aquæ	ad ℥j

Misce.

(2) ℞ Quiniæ sulphatis	gr. 1
Tinct. ferri perchlor.	♏ 10
Acidi nitrici dil.	♏ 5
Aquæ	ad ℥j

Misce.

57. Mist. Sodæ Bicarbonatis.

℞ Sodæ bicarb.	gr. 10—20
Acidi hydrocyanici dil.	♏ 3—5
Mist. camphoræ	℥j

Misce.

58. Mist. Sodæ Bicarb. Effervescens.

(1) ℞ Sodæ bicarb.	gr. 10
Potassæ bicarb.	gr. 5
Ammoniæ carb.	gr. 6
Tinct. calumbæ	♏ 20
Syr. aurantii	♏ 30
Aquæ	℥jss

To be taken in effervescence with a dessert-spoonful of lemon juice.

(2) ℞ Sodæ bicarb.	gr. 20
Syr. limonis	♏ 30
Aquæ	ad ℥ij

To be taken in effervescence with eighteen grains of citric acid. Fifteen or twenty drops of sp. chloroformi may be added to each dose if a stimulant is needed.

59. Mist. Strychniæ c. Ferro.

(1) ℞ Liq. strychniæ	♏ 5
Acidi nitro-hydrochlor. dil.	♏ 10
Liq. ferri perchlor.	♏ 10
Aquæ	℥j

Misce. *(Charing Cross.)*

(2) ℞ Liq. strychniæ	♏ 5
Acidi nitro-hydrochlor. dil.	♏ 5
Liq. ferri perchlor.	♏ 10
Syr. simplicis	ʒjss
Mucilaginis	ʒj
Aquæ	ad ℥j

Misce.

60. Mist. Valerianæ.

℞ Tinct. valerianæ	♏ 48
Infusi valerianæ	℥j

Misce. *(University College.)*

61. Mist. Valerianæ Co.

℞ Tinct. valerianæ ammon.	♏ 33
Tinct. camph. co.	♏ 10
Sp. ammon. aromat.	♏ 20
Aquæ camphoræ	℥j

Misce. *(University College.)*

62. Pigmentum Collodii.

℞ Collodii	℥ss
Ol. ricini	℥j

Misce.

An excellent application for burns or scalds, or in erysipelas.

63. Pigmentum Cretæ Preparatæ.

℞ Cretæ preparatæ	ʒv
Ol. lini (vel olivæ)	℥j
Acidi acetici dil.	♏ 10

Misce.

To be painted on the part with a camel's-hair brush. For burns, *scalds, or in erysipelas.*

64. Pigmentum Iodi.

℞ Iodi	gr. 10
Sp. ætheris nit.	ʒij
Sp. vini rect.	℥ss
Collodii	ʒij

Misce.

A useful application for chilblains.

65. Pil. Aloes c. Myrrha.

℞ Aloes	gr. 2
Myrrhæ	gr. 1
Saponis	gr. 1
Ol. carui	♏ ¼
Aquæ	q. s

Misce. *(Guy's.)*

This pill, under the name of Rufus' or Widow Welch's Pill, is a very useful and popular remedy in cases of chlorosis and irregular menstruation.

66. Pil. Assafœtidæ.

℞ Ext. aloes soc.	gr. 1
Saponis dur.	gr. 1
Assafœtidæ	gr. 3

Misce. *(Middlesex.)*

67. Pil. Colchici Co.

℞ Ext. colchici acet.	gr. 2
Pulv. Doveri	gr. 3

Misce. *(Middlesex.)*

68. Pil. Ferri Sulph. et Aloes.

℞ Ferri sulph. exsicc.	gr. 2
Ext. aloes Barbad.	gr. 1
Saponis dur.	q. s.

Misce.

69. Pil. Hydrarg. Iodidi.

℞ Hydrarg. iodidi vir.	gr. ⅛
Pulv. opii	gr. ¼
Micæ panis	q. s.

Misce. *(University College.)*

70. Pil. Hydrarg. Subchlor. c. Opio.

℞	Calomelanos	gr. 1
	Pulv. opii	gr. ¼
	Conf. rosæ caninæ	q. s.
	Misce.	(*King's College.*)

71. Pil. Nucis Vomicæ.

℞	Ext. nucis vomicæ	gr. ½
	Ext. gentianæ	gr. 4
	Misce.	(*London.*)

72. Pil. Potassii Iodidi.

℞	Potassii iodidi	gr. 1
	Ext. gentianæ	gr. 2
	Misce.	

These pills should be silvered.

73. Pil. Quiniæ Co.

℞	Quiniæ sulph.	gr. 1
	Ext. conii	gr. 3
	Misce.	(*Middlesex.*)

74. Pil. Quiniæ c. Ferro.

℞	Quiniæ sulph.	gr. 2
	Ferri sulph.	gr. 2
	Ext. gentianæ	gr. 1
	Misce.	(*St. Thomas's.*)

75. Pil. Zinci Valer. Co.

℞	Zinci valer.	gr. ½
	Quiniæ sulph.	gr. ⅓
	Pil. rhei co.	gr. 1
	Ext. gentianæ	gr. 2
	Misce.	(*London.*)

76. Ung. Calomelanos.

℞	Hydrarg. subchlor.	[illegible]
	Adipis	[illegible]
	Misce.	

77. Ointment for Bed-sores.

Take one pound of mutton suet from the kidney. Boil it in three or four pints of water; strain it, and when cold it will float on the top of the water. Rub it between the hands till it looks like cold cream; then spread it with the palm of the hand very smoothly upon linen, not too fine. Be careful to boil the suet in a perfectly clean saucepan, and that there is no salt or grit along with it.

78. Bread Poultice.

"Scald out a basin, then immediately put in some boiling water, and throw into it coarsely crumbled bread. Cover the basin with a plate. When the bread has soaked up as much water as it will imbibe, drain off the remainder, and there will be left a light pulp. Spread it a third of an inch thick on folded linen, and apply it when at the temperature of a warm bath." (ABERNETHY.)

79. Linseed Meal Poultice.

"Get some linseed powder, not the common stuff full of grit and sand. Scald out a basin. Pour in some perfectly boiling water, throw in the powder, stir it round with a stick till well incorporated. Add a little more water and a little more meal, stir again, and when it is two-thirds the consistency you wish it to be, beat it up with the blade of a knife till all the lumps are removed. If properly made it is so well worked together that you might throw it up to the ceiling and it would come down again without falling into pieces. It is in fact like a pancake. Then take it out and lay it on a piece of soft linen, spread it the fourth of an inch thick, and as wide as will cover the whole inflamed part. Put a piece of hog's lard in the centre of it, and when it begins to melt draw the edge of a knife lightly over and grease the surface of the poultice." (ABERNETHY.)

80. Mustard Poultice.

Mix the mustard with cold water and knead it to the consistence of putty. Spread it the eighth of an inch thick upon brown paper, or linen, warm it before the fire, and apply it to the part affected—putting a *thin* piece of muslin between it and the skin.

81. Bran or Hop Poultice.

Fill a bag one-third full with bran, or hop-flowers, moistened but not thoroughly wetted, with boiling water. Shake the bag and hold it before the fire till it is thoroughly hot, and then apply it to the affected part.

82. Bryony Poultice for Bruises.

A poultice made of black bryony root (deprived of its bark and finely scraped) and bread crumbs, or flour, should be enclosed in a muslin bag, and applied over the injured part. It will generally cause the ecchymosis to disappear within twenty-four hours. (TYRRELL on "Diseases of the Eye," i. 200.)

83. Ice Poultice.

Take of linseed meal a sufficient quantity to form a layer from three-quarters to an inch thick, and spread it on a cloth of proper size. Upon this, at intervals of an inch or more, place lumps of ice the size of a big marble, then sprinkle them over with the meal, cover with another cloth, folding in the edges to prevent the escape of fluid, and apply the *thick* side to the surface of the wound. (MAISONNEUVE.)

84. To Dress a Blister.

When sufficiently raised carefully draw off the blister; and where you see the skin overhanging, snip it in three or four places with sharp-pointed scissors, having first taken care to place a clean soft rag below the blister to catch the water that runs from it. Be very careful not to snip anything but the raised skin, or you will have a sore afterwards. When the water has been stanched, apply a bread-and-water poultice. When the poultice comes off, spread some lard or cold cream on a clean piece of linen rag, and lay it over the part, which will soon heal.

85. White Wine Whey.

Boil half a pint of new milk with a dessert-spoonful of sifted sugar. Pour in a wine-glassful of sherry or Madeira. To be taken quite hot.

86. Egg-Flip.

Beat the yolks of two new-laid eggs with a dessert-spoonful of sifted sugar, and stir into a quarter of a pint of boiling white wine or brandy-and-water. To be taken hot.

87. Treacle Posset.

Boil half a pint of new milk, and while boiling stir in two tablespoonfuls of treacle. To be taken hot.

88. Linseed Tea.

Put one ounce of linseed and half an ounce of Spanish liquorice into a jug; pour over them a pint and a half of boiling water; cover close, and let it stand till quite cold. Strain off. To be made hot as wanted, or taken cold.

89. Imperial Drink.

Put half an ounce of cream of tartar, the juice of one lemon, and two table-spoonfuls of sifted sugarinto a jug, and pour over them one quart of boiling water. Cover till cold.

90. Tamarind Drink.

Take a quarter of a pint of tamarinds. Pour over them one quart of boiling water. Sweeten to taste. Cover, and let it stand for an hour.

91. Meat Paste.

Take a small piece of raw meat (perfectly free from fat), beef, mutton, or chicken, shred it as fine as possible, and rub it through a sieve so as to form a smooth paste. Mix a piece the size of a pea up with a little cream and sugar. To be given frequently. In cases of extreme exhaustion from diarrhœa or other causes it is very useful, specially for children. It may be given as a sandwich between thin pieces of bread if preferred.

92. Pounded Meat.

Take some chicken partly, but not thoroughly, boiled, clear it perfectly from skin, shred it as fine as possible, beat it to a paste in a mortar with a little of the liquor it was boiled in. Simmer it gently for a few minutes with as much of the liquor as will bring it to the thickness of gruel.

93. Essence of Beef.

Cut a pound of beef from the rump or sirloin, free from fat, into small slices, put it in a stone jar with a cover, without any water. Fasten the cover down well with a double bladder. Stand the jar in a saucepan of hot water and simmer for six hours. When you take it out you will find about a teacupful of the strongest beef juice. Give at first a tea-spoonful at a time. It is palatable either hot or cold, and so light that it will remain on the stomach when even toast-and-water is rejected. If preferred as a jelly, a little isinglass may be put in the jar at first with the meat. Salt must be added afterwards.

94. Beef Tea.

The beef must be very fresh. Take four pounds of the upper-side of the round, cut it into small pieces, leave out every bit of fat, put it into a jar with a salt-spoonful of salt and three pints of cold water. Tie it closely down, place it in a saucepan of water, and let it boil gently for five hours. The precaution of passing a piece of stale crumb of bread over the surface, before serving, should be carefully observed, lest any fat should remain.

95. Veal Tea.

Cut up into small pieces three pounds of lean veal, put it into an enamelled saucepan with three pints of cold water and a salt-spoonful of salt. When it boils skim very carefully. Simmer for three hours. Strain into a basin, and, when cold, remove every particle of fat. When required pour half a pint, while boiling, on to a teaspoonful of arrowroot which has been mixed with a dessert-spoonful of the cold veal tea.

96. Chicken Broth.

Cut up a fowl, and break the leg-bones. Put it into a stewpan with a quart of cold water, a tea-spoonful of salt, and the same quantity of loaf sugar. Boil gently, skimming constantly, for four hours. Then strain into a basin. When cold, take off the fat. When required for use, warm a cupful.

97. Chicken Jelly.

Take a whole chicken, cut it up, put it into a jar, pour over it a teacupful of cold water, tie it down very closely with a bladder, place the jar in a saucepan of water, and boil quickly for nine hours. Strain the liquid through a sieve. When it is cold, remove the fat. A most nourishing and agreeable jelly remains.

98. Port Wine Jelly.

Take two ounces of isinglass, two ounces of gum arabic, two pints of port wine, and put them into a jar with a lid. Put the jar, well covered, into a stewpan of boiling water, and place it on a hot plate, or over a slow fire, till it is quite dissolved. Then pour into small moulds and let it cool.

99. Port Wine Lozenges.

Take two ounces of isinglass, one ounce of gum arabic, two ounces of sugar candy, and one pint of port wine. Set these in a jar of cold water, and let it simmer by the fire, stirring it with a clean wooden spoon till quite dissolved. When it cools, it will harden into a jelly, and may be cut out in squares.

100. Isinglass and Eggs.

Boil the third of an ounce of the best isinglass and a dessertspoonful of sifted loaf sugar in the third of a pint of water. When quite dissolved, add three drops of orange flower water, and the yolks of two new-laid eggs well beaten. Boil up for one minute, strain through muslin into a small mould, and serve when cold.

101. Flour Gruel.

Tie up one pound of flour tightly in a cloth, place it in a saucepan of cold water, and boil it for four or five hours. When taken out it will be a hard ball. Pare away the outer rind. When needed for use scrape off a sufficient quantity and mix with boiling milk to the thickness of gruel.

An excellent food in diarrhœa.

102. Soupe à Vin.

Take two or three slices of bread from which the crust has been cut. Toast them, and lay them in a soup plate, dusting each piece over with sifted white sugar. Then pour over all about a tumblerful of hot wine and water. Port wine or claret is the most suitable for the purpose.

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